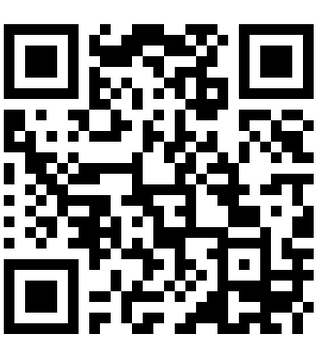

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OF

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A RECORD OF THE PROGRESS OF THE TELEGRAPH AND OF ELECTRICAL SCIENCE.

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THE SCIENTIFIC PRINCIPLES INVOLVED IN ELECTRIC LIGHTING.

By Prof. W. Grylls Adams, F.R.S.

A series of "Cantor Lectures" delivered before the Society of Arts, London, 1881.

(Continued from Vol. XIV, page 370)

WITH GRAMME MACHINE.

In Auerbach and Meyer's experiments for 800 revolutions a minute, the maximum electro-motive force is 76 volts, and for 51 volts, or two-thirds of the maximum value, there is a current of 6·5 webers through a resistance of 7·8 ohms. Below this value the current is unsteady. With Siemens' machine, a speed of 700 revolutions a minute gave a maximum electro-motive force of 76 volts, and for 51 volts there is a current of 15 webers through a resistance of ·6654 ohms. With a small Siemens machine, a speed of 1,000 revolutions per minute gave a maximum electro-motive force of 42 volts, and for two-thirds of this, or 28 volts, the current was 11 2 webers through about 2·2 ohms resistance.

Dr. Hopkinson has investigated the way in which the electro-motive force in a Siemens machine depends on the current. He has shown that:

1. The electro-motive force is, for a given current, proportional to the speed of revolution of the armature.

2. That the electro-motive force does not increase indefinitely with increasing current, but

3. Only increases in the direct ratio as the current increases up to about two-thirds of its maximum value.

The current is very unstable for small change of resistance, or of speed of engine, as long as the value of electro-motive force is less than two-thirds of its maximum value. There is a remarkable difference in the ratio $\frac{E}{C}$ depending on change of speed from 600 to 700 revolutions a minute, where the current changes from 5 to 15 webers, for this increase of one-tenth of the speed.

As regards the relation of work converted into electrical energy to the work expended to produce it, it appears from the experiments of Mr. Schwendler and Dr. Hopkinson that, with the Siemens machines employed by them, the loss of power was from 12 to 14 per cent., so that if the external resistance of the circuit, *i. e.*, the electric lamp, etc., be so adjusted that half the total work produced appears in the arc, then 43 or 44 per cent. of the total work expended is produced in the arc.

The results arrived at by Dr. Siemens, with his latest machine on Wheatstone's principle are: 1. That the electro-motive force, instead of diminishing with increased resistance, increases at first rapidly and then more slowly towards an asymptote. 2. That the current in the outer circuit is actually greater for a resistance of 1½ ohm than for one ohm.

With a current of 30 or 40 webers, the horse-power expended was 2·44 h. p., and the effective work 1·29 h. p., giving an efficiency of 53 per cent., as compared with 45 per cent. in the ordinary Siemens machine. The maximum energy which can be converted into heat in the machine is 1·3 h. p. The new machine will give a steadier light with greater economy, and may be driven by a smaller engine.

THE BRUSH MACHINE.

Among the latest continuous-current machines are two which promise to be very successful machines. The Brush, with a ring on the Gramme system, with eight divisions or portions hollowed out to receive the coils, the bobbins at opposite ends of a diameter being connected together and to a commutator. When a pair of bobbins passes the neutral point, so that there is no current in it, it is put out of circuit for one-eighth of a revolution, so that the current produced in the other bobbins is not wasted, by being sent through the resistance of the two which are producing no current. On the inducing magnets are wound fine wires, offering considerable resistance, which carry the current when the external circuit is open and keep up the magnetism; but when the circuit is closed, the thick wires on the magnets carry the principal part of the current.

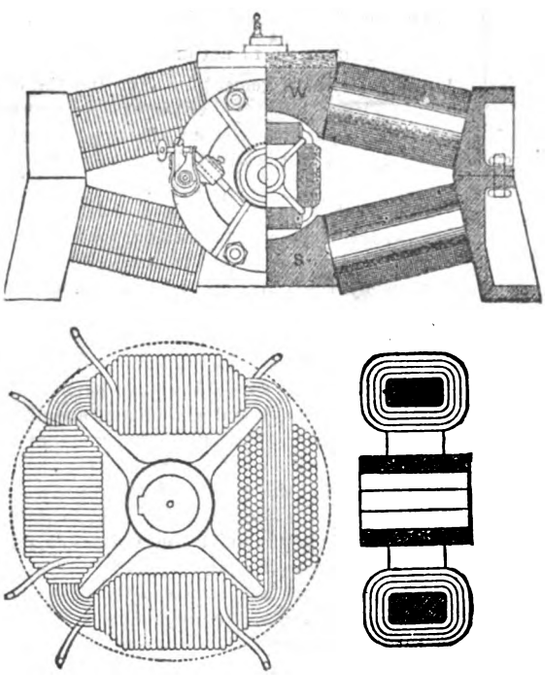


Fig. 5.—The Bürgin Machine.

The internal resistance of the machine being about 10½ ohms and the external resistance 73 ohms, there was, according to calculation, a current of 10 webers and an electro-motive force of 839 volts. With these numbers, the effective work on the external circuit ought to be 87·36 of the whole electrical work produced; but, practically, it is only 61 per cent.

This relation of work converted into electricity to the work expended in this machine, is about 73 per cent., whereas with both Gramme's and Siemens' machines, with relatively smaller external resistances, this ratio is about 88 per cent.

Another continuous-current machine is the Bürgin machine, from Switzerland, which has only just been introduced into England by Mr. Crompton. Four or six coils are wound on the sides of a square or hexagonal frame, consisting of iron wires. The corners of the frame come very near to the poles of the magnets. There are six or eight of these frames arranged successively in the form of a helix. The action is similar to that of the Gramme machine, the dynamo-electric principle being introduced in this as in other machines. The construction of the machine is very simple, and its efficiency has been proved by M. du Moncel and also by Mr. Crompton to be remarkably good. These machines are of small internal resistance, and are driven at high speed (up to 1,600 revolutions a minute), so that there is considerable electro-motive force.

The efficiency of certain Gramme machines, exhibited by Mr. Crompton and tested at the Glasgow Electric Light Exhibition, was shown to be such that, with a power of 4 h. p. expended in producing the current, only ½ h. p. was expended on friction and passive resistances, so that about 88 per cent. was net power. This 3½ h. p. converted into electricity gave a current of 32 webers through a resistance of about 2 ohms, *i. e.*, an internal resistance of 1·077 ohms, and the arc of a Crompton lamp giving a light equivalent to 2,158 candles.

Now, we may compare with these the results obtained by Mr. Crompton for the Bürgin machine, running at a speed of 1,675 revolutions per minute.

Five machines were tested, and the total work expended was 5·45 h. p. The amount spent on friction and passive resistances, when the circuit was open, was about ·25 h. p., so that about 86 per cent. is net power. The work converted into electrical energy, 5·2 h. p., gave a current of 20·15 webers through an internal resistance and conducting wires of 2·8 ohms, together with the arcs of three Crompton lamps (about 5 ohms), each giving a light of 2,103 candles, measured horizontally; the electro-motive force $= \frac{\text{work}}{\text{current}}$ being equivalent to 163 volts.

With photometric measurements made horizontally, the electric light being level with the gaslight,

the carbons being concentrically adjusted, and the length of the arc being about 3 m.m., the greatest amount of light was found to be obtained at 1,675 revolutions per minute, with three lamps, each of 2,103 candles, or with 4 lamps, each of 1,246 candles. The upper carbon was 10 m.m. and the negative carbon 13 m.m. in thickness. The consumption of the upper carbon was 4 c.m. and the lower nearly 2 c.m. per hour. The total horse power expended was 5·55 h. p., and the current, with 3 lamps, varied from 18·36 to 21·94 webers, and with 4 lamps, from 16·9 to 19·6 webers. All three lights were very steady and much whiter than the single lights of Gramme's machine.

Mr. Crompton has been kind enough to lend me, this evening, a new Bürgin machine, about which he gives me the following facts: It was tried at 1,620 revolutions a minute, and a current of 28 webers was sent by it through 3 lamps, in series. When the arcs were lengthened to one-fourth of an inch each, the current was 24 webers, and the arcs gave a light of 5,000 candles each, the photometric measurements being made in the most advantageous direction.

The British Electric Light Company have been good enough to place at my disposal, for this evening and for my lecture next week, two Gramme machines for trying some of the electric lamps which have been kindly lent to me.

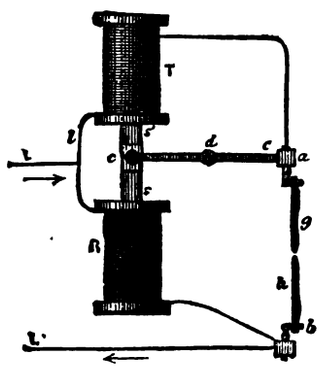


FIG. 6.—Siemens' Differential Lamp.

These machines are driven by a steam engine lent by Messrs. Robey, of Lincoln, and for the Brockie and other electric lamps I am indebted again to the British Electric Light Company, to Dr. Siemens, to Mr. Crompton; to Mr. Latimer Clark for the Lontin lamp; for the Rapieff and Wilde electric candle, to Mr. Berley; to the Jablochkoff Electric Light Company for their candles; and to the Anglo-American Light Company for the Brush lamp.

THE BROCKIE LAMP.

The upper carbon is attached to an iron tube, which passes into a solenoid, through which it passes as the positive carbon burns away. The solenoid forms a shunt or by-pass for the arc, and takes a small part of the current and holds up the iron tube which carries the upper carbon; as more current passes through the coils, the motion of the carbon is stopped.

A commutator is so arranged and driven by the dynamo machine as to break the current and allow the carbons to come in contact for an instant at regular intervals, say every minute. Then the circuit is completed again, the upper carbon is drawn to its proper distance apart, and the light continues. At every minute the light goes out, but instantly relights, and no variation of light is perceived.

SIEMENS' DIFFERENTIAL LAMP.

A thick-wire bobbin (T) carries the arc current, and another fine-wire bobbin (B) forms a shunt to the arc. The interval between the bobbins equals the height of each of them. The iron rod *s s'* is of twice the length of each bobbin, and its ends in the normal position are at the centres of the bobbins. The attraction by the thick-wire bobbin tends to lengthen the arc and diminish the current, and so its attraction is weakened and the arc is again diminished, the attraction on the iron being regulated by the change of resistance in the arc. A pendulum arrangement is attached to prevent the oscillations of the carbon from being too sudden.

CROMPTON LAMP.

The carbons are brought together by means of the weight of the upper carbon holder, as in the Serrin lamps. The carbons are controlled by means of an electro-magnet, of which the principal armature separates the carbons, and a light secondary armature is arranged on the back of the large one, and does the more delicate work of bringing the carbons together. The large armature supports the negative or lower carbon; and when the small armature has brought the carbons together, so that a current passes, the large armature separates them to the proper distance apart for a good light. When the arc is broken, the armature, supported by a spring, is raised, and brings the carbans into contact, and relights the lamp. The small variations in the strength of current react on the second armature, which is held at some distance above the large armature by a light spiral spring. The small armature carries an arm, which is applied as a brake wheel, which is the last wheel of a train of wheels set in motion by the weight of the positive rod.

REGULATOR IN BRUSH SYSTEM.

A very pretty arrangement for shunting the current past a lamp (when it is not in use), so that one lamp may be put out without affecting the other lamps in the circuit, is adopted on the Brush system.

The current passes through a solenoid coil, wound with thick wire, and then passes to the upper carbon, through the arc to the lower carbon, and then by the frame to the next lamp. The solenoid holds up a rod of iron, which tilts a ring on one side, through which the carbon passes, and so locks it. To the end of a thick wire of the solenoid is attached a thin wire (150 ohms), which is also wound on the solenoid, and which forms a shunt or by-pass to the arc, taking more and more of the current as the resistance of the arc increases. This thin wire is wound the opposite way, and the current in it relaxes the hold on the carbon, so that it falls away slowly, and then takes more of the current. As soon as it does so it is again held fast. To prevent the carbon from falling too rapidly it is passed through a vessel containing glycerine, and slides downwards very slowly. The current through the thin wire also passes through another solenoid, which forms a shunt or by-pass to the whole lamp, so as to take all the current past the lamp if it should get out of order. When a considerable current flows by this path—*i. e.*, if the arc becomes an inch long, so that its resistance is greatly increased—the second solenoid draws up a piece of iron, which lets all the current pass, and the lamp is thrown out of the circuit.

In the Brush lamp, which is designed to burn 16 hours, there are two pairs of carbons, with the rings on the upper carbons, which hold them by friction, so adjusted that one is held about one-fourth of an inch above the other, and, therefore, the second carbon will not come into action until the first falls or is burnt out.

All the electric candles, such as the Jablochkoff candle, the Jamin candle, the Wilde candle and the De Meritens candle, consisting of three carbons, are fed by means of alternate current machines, because it is essential that the two carbons should burn away equally. In the Jamin and the Wilde candle the carbons are at first in contact, but when the current passes one of the carbons is separated from the other, because its holder is set on a hinge, so as to be acted upon by a small electro-magnet through which the current passes.

M. Joubert has found that it is necessary, in order to keep the arc steady with the Jablochkoff candle, that the alternate current in the circuit should have a mean value of eight or nine webers, and that below five webers the arc cannot be kept alight; between the bases of the two carbons forming the candle there is an electro-motive force of 40 or 45 volts. The Jablochkoff candle uses up about 66 kilogrammetres of work, of which 33 kilogrammetres, or 4.6 h. p., is converted into heat and light.

When the arc is produced in a magnetic field, either by disturbing it by an electro-magnet, or by placing a frame around it, as in the Jamin candle, it is necessary to have a current half as large again as when the electro-magnet is not in action. One-third of the energy of the current is in such a case spent in producing a strong magnetic field around the electric arc, and is, therefore, so much wasted energy, as far as the electric light is concerned.

When gas was first introduced extensively for lighting purposes, many objections were raised to its use, and among them was one which was recorded by Clement Desormes, in 1819, which is summed up in the following quotation:

"The light is of a disagreeable yellow color, entirely different from that red and warm gleam of oil lamps; it is of a dazzling brightness; its distribution will be impossible and irregular, and it will be much dearer than oil lighting, and, even if it should be improved, it will still remain much dearer than those lights which we already possess."

Just as Desormes had become accustomed to the red gleam of oil lamps, and objected to the coldness of the yellow gas light, so, a year or two ago a similar objection was raised against the electric light, that it was entirely different from the yellow and warm gleam of gas light; that it is of a dazzling brightness; that its distribution would be impossible and irregular; and that our streets would be left in darkness.

These objections do not seem to be so strongly taken up by the public as they were two years ago, for they have seen several trials of the electric light; and, although there are many difficulties in the way, yet the fact that the electric light has all the colors more uniformly blended, and is, therefore, a whiter light than gas, and enables objects to be seen in their true colors, can hardly be urged any longer as an argument against its use. The same argument might be urged for the same reason against bright moonlight, or against the light of day, and in favor of the yellow London fog. The Kyrle Society, in its search after truth and beauty, must surely be strong supporters of the spread of the electric light.

If we return to the Report of the House of Commons, we find the following statement:

"A remarkable feature of the electric light is that it produces a transformation of energy in a singularly complete manner. Thus the energy of 1-horse power may be converted into gaslight, and yield a luminosity equal to 12-candle power. But the same amount of energy transformed into electric light produces 1600-candle power."

The experiments of Mr. Schwendler, of Dr. Hopkinson, and of others, have shown that, both with the Siemens machine and with the Gramme ma-

chine, 88 per cent. of the total work expended is converted into electrical energy. Theory has established that, if the external resistance of the circuit is equal to the internal resistance of the battery or magneto-machine, the available work in the external circuit is a maximum.

Suppose, then, that we have 40 Grove's cells, each of .25 ohms resistance, and of an electro-motive force of 2 volts, the external resistance being 10 ohms—

$$\text{Then } Q = \frac{E}{R+r} = \frac{40\,E}{40 \times .25 + 10} = 4 \text{ webers,}$$

$$\text{and } EQ = 2 \times 4 \times 40 = 320.$$

$$\text{The work done in the external circuit is } \frac{320}{9.81 \times 2} =$$

16 kilogrammetres per second nearly, or about 2·9ths h.p.

(*To be Continued.*)

THE SANCTITY OF TELEGRAMS.

A QUESTION of wide public interest has been brought to the front by the action of a judge at Shelbyville, in Tennessee. Men of all sorts and conditions now use the telegraph almost as freely as the post-office, not only in the transaction of their business but in social and domestic affairs. It concerns, therefore, every home as well as every enterprise and every industry in the land to know precisely how far messages lodged with telegraph companies are sacred from the scrutiny of third parties.

The Grand Jury at Shelbyville, Tenn., acting under the instruction of the Circuit Court of Bedford County, in that State, in pursuance of a general inquisition into transactions of certain business men of that place in cotton and provision "futures"—on the theory that such transactions are in conflict with the Tennessee laws against "gaming"—the other day caused an order to be served upon the manager of the Western Union Telegraph Company's office at Shelbyville, requiring him to produce before the Court all telegrams "by which contracts or dealings were had with the Nashville Brokerage Association for wheat, corn, rye, cotton and oats, and all messages sent by and to said agency from Shelbyville from August 1 to December 1, 1881, concerning or connected in dealings in futures."

On the return of the order the telegraph company, through its manager, declined to produce its message files, on this ground, among others, that such an order or subpœna was irregular and illegal, as partaking of the nature of a search-warrant or "drag-net," designed to sweep in evidence which might or might not be found after search, and not specifically calling for papers or evidence already shown to exist. It was argued in this behalf by the telegraph company that under the principles of law and under adjudicated cases the only subpœna competent to compel the production of its telegraphic messages is one which designates a paper already shown to exist upon the files, in sufficiently apt terms to admit of its identification, and which does not demand all such telegrams apparently relating to the matter as might possibly be found after the miscellaneous messages of the innocent public as well as of the suspected parties had been scrutinized.

It was further argued by the telegraph company that it is not itself competent to decide what messages on its files concern dealings in "futures;" that it cannot be constituted a judge for the purpose of determining that point; and, finally, that no telegraph company can designate any particular telegrams from its files as pertinent to such an issue without incurring the risk of thereby disclosing telegrams which are irrelevant, as concerning the transactions of innocent parties, and thus violating its duty to the public as well as a statute of Tennessee, which prescribes the confidential treatment of telegrams and orders secrecy to be observed in regard to them under certain pains and penalties.

The Court, however, on the report of the Grand Jury, overruled the points taken by the telegraph company, and directed compliance with the order, meanwhile shifting the ground with some ingenuity so as to make the Grand Jury further call on the manager to disclose the names of all persons who had sent messages through his office relating to "futures" To do this, of course, would be to furnish material on which to found a competent subpœna. The telegraph company presented substantially the same objections to this demand, arguing that it involved only another method of compelling the doing of an unlawful act, and maintaining that the company claimed for its agents, and for the private papers of the public in their charge, only and precisely the same immunity from "unreasonable search and seizure" which all citizens enjoy under the Constitution as to their persons and their papers; these being expressly within the protection of the Constitution of Tennessee as well as of that of the United States. But the Court held the witness to be in contempt for his failure to comply with the order, and imposed upon him a fine of $50, with ten days' imprisonment.

The case now rests at this point, the Grand Jury having adjourned, but the unfortunate operator is locked up, and the telegraph company is fined for insisting upon the sanctity of private affairs intrusted to its care.

It is clearly time that an end should be put by legislation to these scandalous attempts at violating the rights of private life under different forms of judicial and legislative inquiry. There is no conceivable reason why telegrams should not be as sacred from investigation and disclosure as letters in the mails.

As to letters, the United States Supreme Court has declared that "The constitutional guarantee of the right of the people to be secure in their papers against unreasonable search and seizure extends to their papers in the mails, and wherever they may be." This last phrase clearly covers and ought to cover the papers of the people when confided to a telegraph company as completely as when confided to the mails.

Justice Cooley, who is high authority, in discussing this general subject, and the analogy between letters and telegrams, maintains, "that the public are not entitled to a man's private correspondence, whether obtainable by seizing it in the mails or by compelling the operator of the telegraph to testify to it, * * * and compulsory process to obtain it [*i. e.* under *subpœna duces tecum*] would be nothing short of a most arbitrary and unjustifiable seizure of private papers—such an 'unreasonable seizure' as is directly condemned by the Constitution. * * * Perhaps nothing in legal history is more remarkable than the general acquiescence of the public in the asserted right to bring into courts and before legislative bodies, as instruments of evidence, private messages sent by telegraph. It is remarkable, not only because legal analogies and precedents seem to be against the right, but also because the power to make use of telegrams is liable to enormous abuses, and seems to be opposed to one of the first and most vital priniples of liberty. * * * It [the production of telegrams] renders one of the most important conveniences of modern life susceptible at any moment of being used as an instrument of infinite mischief to the community, and one can picture to his own mind about what would be the condition of things in any neighborhood if its whole correspondence were exposed to the public gaze."

Perhaps the settled doctrine of the courts, so far as it can be said to be settled by the limited adjudication so far had on these comparatively novel points, does not go to the extent advocated by Justice Cooley, but rather holds that a telegram is not a privileged communication, and may, therefore, be reached under proper form of subpœna if sufficiently designated. But, except by the Tennessee court in the present instance, it has never been maintained for a moment that a telegraph company may be compelled to sift its files and produce what its agents suppose to be relevant, whether the matter produced concerns the confidential communications of innocent parties or not.

The Western Union Company, which has resisted this assumption, and Mr. C. A. Wallace, its local manager, who has submitted to imprisonment in defense of a most important right of the people, deserve, and will doubtless receive, the thanks not only of the business community but of all right-minded people and all lovers of liberty.—*N. Y. World.*

P. S.—Since the above, after three days' imprisonment, the Supreme Court of Tennessee has granted a supercedeas suspending the sentence until the whole matter is reviewed and examined by the Supreme Court.

ELECTRICAL STEEL MELTING.

ON Tuesday, October 11th, the members of the Iron and Steel Institute visited the telegraph construction works of Messrs. Siemens Bro., at Charlton, on which occasion Dr. Siemens, F. R. S., exhibited his experiment of melting steel by means of the dynamo-electric current, when five pounds of steel were melted in twenty-five minutes. The apparatus employed consists of an ordinary crucible of plumbago, or other highly refractory material, placed in a metallic jacket, or outer casing, the intervening space being filled up with pounded charcoal, or other bad conductor of heat. A hole is pierced through the bottom of a crucible for the admission of a rod of iron platinum or dense carbon, and the cover of the crucible is pierced for the reception of the negative electrode, which is suspended at one end of a beam by means of a strip of copper. The other end of the beam is attached to a hollow cylinder of soft iron, free to move vertically within a wire solenoid, one end of which is connected with the positive and the other with the negative pole of the electrical arc.

Obviously it matters not how the electricity used in this experiment may have been generated. Any source of power might be employed for driving the dynamo machines. In other words, steel may be melted by water power.

TELEGRAPHERS' AID SOCIETY.

FOLLOWING is a statement of the condition of the Telegraphers' Aid Society up to Dec. 7, 1881.

Receipts from all sources since organization	$1,174.50
Payments for benefits to members and current expenses	662.44
Balance cash on hand	$512.06

Total number of members admitted, 143.

WM. MAVER, JR.,
Secretary.

Journal of the Telegraph.

PUBLISHED SEMI MONTHLY AT 195 BROADWAY.

THE JOURNAL is issued on the 1st and 16th of each month. Its circulation is over 13,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included.....$2.00
One Copy, six months, postage included..... 1.00
Single Copies, 10 cents.

ADVERTISING RATES.

One Inch space—each	insertion	$ 2.00
Half Inch "	"	1.00
Quarter Column,	"	4.00
Half "	"	8.00
One "	"	16.00

Cuts charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, JANUARY 1, 1882.

HOSTILE STATE LAWS AGAINST TELEGRAPH BUSINESS.

THE public, as well as telegraph companies, are frequently called upon to witness the diversity of the laws and decisions relating to telegraph companies, either to their property, management, or mode of conducting business with individuals in the various States. This has already reached such an extent that the time is near at hand when national legislation must intervene for the protection of the public conveniences which are afforded by communication by telegraph. In another column may be found a singular case in Tennessee where there is a statute that forbids the disclosure of the contents of telegraphic messages, and a decision or order of a court that all the messages must be examined to see if there are any that may be what the court calls illegal, to wit, "dealing in futures." The question presented, in effect, is whether all the messages received in the State, or sent from there, are subject to be inspected by a mere pretence, it may be, for any assigned cause or information. The telegraph companies are concerned to prevent this only as the servants of the public and to protect confidential messages. If this cannot be done, what can prevent a State passing laws prohibiting sending cipher messages? This is something that would not be advocated for a moment in any community.

We may say, in passing, that there is no law in Tennessee against dealing in futures or against gaming, and it is not contrary to the common law, even gambling itself is not offensive to the common law. But without any further comment on this case we will refer to what the N. Y. *World* has said of it, which may be found in another column.

About two years since a proposed statute was presented to Congress, asking their action to protect telegraph communications against hostile State action, either by statutory enactments or by judicial decisions.

It was urged on the part of the company that the telegraph is now a part of inter-State commerce and communication, and as such is entitled to be protected and regulated, if need be, by national legislation. If this be so, the various statutes and decisions relating to the post-office, to railroads, and to express companies, when affected by State legislation, will be applicable to the telegraph. The main point to be at first established is how far telegraphs can be considered to be within the rules applied to post-roads, railroads, and other transactions relating to the carrying of passengers, goods, or communications from, or into, or through the various States. These questions are not new, but perhaps it will be a surprise to many of the Solons who are doing all they can by legislation to impede a fair and constitutional intercourse between the States, to learn that the Supreme Court of the United States has already discussed the principles involved in asking Congress to aid and protect the general public from unjust State interference with telegraph business.

In regard to the telegraph being an instrument of inter-State commerce, and entitled to national protection as such, we will quote the language of Chief Justice Waite, in the U. S. Supreme Court, in Pensacola Tel. Co. *vs.* Western Union Tel. Co., 96 U. S. Rpts., p. 1, as follows:

"Since the case of Gibbons *vs.* Ogden (9 Wheat, 1), it has never been doubted that commercial intercourse is an element of commerce which comes within the regulating power of Congress. Post-offices and post-roads are established to facilitate the transmission of intelligence. Both commerce and postal service are placed within the power of Congress, because, being national in their operation, they should be under the protecting care of the national government.

"The powers thus granted are not confined to the instrumentalities of commerce or the postal service known or in use when the constitution was adopted, but they keep pace with the progress of the country, and adapt themselves to the new developments of time and circumstances. They extend from the horse with its rider to the stage coach; from the sailing vessel to the steamboat; from the coach and the steamboat to the railroad, and from the railroad to the telegraph, as these new agencies are successfully brought into use to meet the demands of increasing population and wealth.

"They were intended for the government of the business to which they relate at all times and under all circumstances.

"As they were intrusted to the general government for the good of the nation, it is not only the right, but the duty, of Congress to see to it that *intercourse among the States and the transmission of intelligence are not obstructed or unnecessarily encumbered by State legislation.*

"The electric telegraph marks an epoch in the progress of time.

"In a little more than a quarter of a century it has changed the habits of business, and become one of the necessities of commerce. It is indispensable as a means of inter-communication, but especially is it so in commercial transactions. The statistics of the business before the recent reduction in rates, show that more than eighty per cent. of all messages sent by telegraph related to commerce. Goods are sold and money paid upon telegraphic orders. Contracts are made by telegraphic correspondence, cargoes secured, and the movement of ships directed.

"The telegraphic announcement of the markets abroad regulates prices at home; and a prudent merchant rarely enters upon an important transaction without using the telegraph freely to secure information.

"It is not only important to the people, but the government; by means of it the heads of the departments in Washington are kept in close communication with all their various agencies at home and abroad, and can know, at almost any hour, by inquiry, what is transpiring anywhere that affects the interest they have in charge.

"Under such circumstances it cannot for a moment be doubted that this powerful agency of commerce and intercommunication comes within the controlling power of Congress, certainly as against *hostile State legislation.* In fact, from the beginning it seems to have been assumed that Congress might aid in developing the system; for the first telegraph line of any considerable extent ever erected was built between Washington and Baltimore, only a little more than thirty years ago, with money appropriated by Congress for that purpose (5 Stat., 618), and large donations of land and money have since been made to aid in the construction of other lines (12 Id., 489, 772; 13 Id., 365; 14 Id., 292). It is not necessary now to inquire whether Congress may assume the telegraph as part of the postal service, and exclude all others from its use. The present case is satisfied if we find that Congress has power, by appropriate legislation, to prevent the States from placing obstructions in the way of its usefulness."

Since the above decision a new element of commerce has arisen in telegraph business—this is the transfer of money by telegraph from one point to another. This more frequently occurs where the distance is long than otherwise, hence it may be that it will cross several States, and will be greatly impeded, or, indeed, prohibited, from being carried over the lines without an exorbitant fee, or tax similar to the passenger and freight tax cases of the railroad companies which the United States courts have often been called upon to declare void and unconstitutional.

The people and their representatives should not forget that the telegraph is a public benefit and advantage, and that injury to it is harm to the public at large; that the public is to be considered as above mere local feeling and action, and individual rights are as sacred in telegraph matters as in others.

It is greatly to be deplored that a mistaken local self-interest should be allowed to prevail in legislation against corporations as such, as if they had no rights, forgetting that they must affect individual rights more or less in every instance. It is not a mere question of power with legislators or courts. The public at large have a right to look for justice in legislation and in courts.

WESTERN UNION'S REPORT AND DIVIDEND.

Western Union's quarterly statement, issued yesterday, is rather a surprise to those who have not felt confidence in the company's ability to earn dividends on its $80,000,000 of capital. The company started July 1st of the present year with $127,258.76 surplus. After paying its regular quarterly dividends, including the one just declared, and expending $615,425 for construction and the purchase of new lines, it has a surplus of $1,013,287 18. This shows a net gain of nearly $900,000 in six months, after paying $2,400,000 in dividends. It is claimed by the management that the Mutual Union's competition will in nowise affect adversely these favorable results in the future; that the natural increase of business will be greater than can be done by the other line. In 1870, for instance, the Western

Union transmitted 9,157,646 messages, while for the year ended June 30th last the number increased to 32,500,000, and 40,000,000 is the estimate for the current year. In 1878, the company's revenue was about 9¾ millions, and for the year ended June 30, 1881, it was 14½ millions. In 1878 its profits were about 3½ millions, and for the last year nearly 6 millions. The report shows a continuance of the long-established policy of extending the company's lines by construction and purchase. These expenditures are deducted from income in making up the surplus, and the stockholders are reimbursed for the outlay by a stock dividend whenever the surplus becomes sufficiently large to justify such a course. A cash dividend of 2½ per cent might have been declared yesterday, and a surplus of $213,287.18 still remained, had the management desired to depart from its established practice. Moderate cash dividends, and large stock ones, have been the Western Union's policy for many years, and it seems to have worked so well that a departure from it is not desired by those most interested.—*N. Y. Daily Stockholder*, Dec. 14, 1881.

If you want to become a telegraph operator, send twenty five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

QUARTERLY REPORT OF THE WESTERN UNION TELEGRAPH COMPANY FOR THE QUARTER ENDING DECEMBER 31, 1881.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *December* 14, 1881.

In the Report presented by the Executive Committee at the last Quarterly Meeting of the Board, held September 14, 1881, the net revenues for the quarter ending September 30 (August being partially and September wholly estimated) were stated at $1,949,894.61.

The official returns for the quarter (ended September 30) showed the net revenues to be $2,104,635 75, or $154,741.14 more than the estimate.

The following revised statement, based upon complete returns, will show the condition of the Company at the close of the quarter ended September 30, 1881:

Surplus, July 1, 1881, as per last quarterly Report		$ 127,258 76
Net revenues, quarter ended September 30, 1881		2,104,635 75
		$ 2,231,894 51
From which deducting appropriations for—		
Dividend of 1½ per cent, paid October 15	$1,199,708 76	
Interest on bonded debt	107,000 00	
Sinking Funds	20,000 00	
Construction	202,290 51	
Telegraph Stocks, etc.	113.135 39	
	$1,642,134 60	
Less portion of the Sinking Fund for the Bonds of 1900 (which was set aside previously), returned to the Company by the Union Trust Co., Trustees, because of the drawn bonds not having been presented for redemption	$40,000 00	
		$1,602,134 60
Leaves a surplus, October 1, 1881 of		$629,759 91

The net revenue for the quarter ending December 31, instant, based upon official returns for October, nearly complete returns for November, and estimating the business for December, will be about | | $2,010,527 27
Add Surplus, October 1, as above | | 629,759 91
| | | $2,640,287 18
From which appropriating for—
Interest on Bonded Debt	$107,000 00	
Construction and purchase of Telegraph Stocks and Properties	300,000 00	
Sinking Funds	20,000 00	
		$427,000 00
Leaves a balance of		$2,213,287 18
It requires for the payment of a dividend of 1½ per cent. on the Capital Stock		$1,200,000 00
Deducting which, leaves a surplus, after paying dividend, of		$1,013,287 18

In view of the preceding statements, the Committee recommended the adoption by the Board of the following:

Resolved, That a dividend of one and one half per cent. be, and is hereby declared payable on the 16th day of January next, to stockholders of record, at the close of business on the 20th day of December, instant.

Resolved, That for the purpose of such dividend, the stock books of the Company be closed at three o'clock on the afternoon of the 20th day of December, instant, and be reopened on the morning of the 17th of January next.

Respectfully submitted,
NORVIN GREEN.
President.

Correspondence.

TITLES IN SIGNATURES.

DALLAS, TEX., Dec. 17th.

To the Editor of the Journal of the Telegraph.

In a message where the signatures are—say

"J. W. Jones,
Prest. Cotton Exchange,
Paul Kennedy,
M. C. Crawford."

Please decide for us how many extra words should be counted and why? Respectfully,
"Inquirer."

ANS.—See Executive Order [No. 174, 15th of November, 1878, Vol. XI., No. 265.

"The title of the sender of a message, when such title does not exceed two words, will not be included in the check, but will be transmitted free of charge as part of the sender's message."

By above rule one extra word should be charged for the title to first name, two extras for second name, and three for last name, six in all.

CHICAGO ELECTRICAL SOCIETY.

CHICAGO, Dec. 21, 1881.

To the Editor of the Journal of the Telegraph:

THE fifty-third regular meeting of the Chicago Electrical Society was held last evening in Club Room No. 4, Grand Pacific Hotel, President C. C. Haskins in the chair.

The weather was extremely unpleasant, rain and wind combining to dampen and chill the enthusiasm of all. Despite these untoward influences, the room was filled, and after the usual routine business, Mr. G. W. Felton, manager of the Chicago office of the Western Union Telegraph Company, was introduced and read a highly interesting and instructive paper on "Ocean Currents," which was listened to with marked attention and greeted with enthusiastic and merited applause.

Your limited space forbids a lengthened critique of Mr. Felton's paper, but it is sufficient to say that it was exhaustive and replete with fact and detail on the character, influences and causes of these great and constant commotions of the vasty deep, which are so potent in climatic results throughout the globe. But for these currents the Grand Banks of Newfoundland would never have had an existence, and the telegraph plateau of the North Atlantic would have been an impossibility. The lecturer showed by adduced evidence from Maury and others that the causes of all these stupendous movements are traceable directly to evaporation and thermometric influences and varying densities resulting from these differences.

The society has reason to be proud of its position and ranks to-day with the foremost societies of a scientific character in the United States, if not with those more pretentious in foreign climes.

Papers are now provided for the remainder of the season, and a regular meeting will be held each month.

For January we are to have Prof. T. W. Tobin, of the Louisville Polytechnic, (late the assistant of Pepper in the London Polytechnic), on electromotive force.

February, March and April meetings will be supplied by Messrs. Park, Thomas and Delamater, and at the closing meeting of the season, the President of the society has promised us a paper on the "Universality of Vibrations." D.

THE YOUNGEST OPERATOR.

STRASBURG, VA., *December 24th*, 1881.

To the Editor of the Journal of the Telegraph:

I notice, in your issue of December 16th, an item of news headed "The Youngest Telegraph Operator." I taught a young child in my office, in 1880, in his seventh year; and when he was eight years old he was fully qualified to take charge of a telegraph office. He received and sent messages with Edward Stewart, one of the champion senders, then in Washington City; it was on line No. 18, running from Staunton, Va., to Washington, D. C., this little operator, Master Owen Conner, worked. His father, John Conner, at that time was building manager on the S. V. R. R., between Waynesboro, Va., and Hagerstown, Md., but is now superintending the building of lines west of Cumberland, Md., and Pittsburg, Pa., for the Western Union Telegraph Company. P.

THE SEAMY SIDE OF THE TELEGRAPH.

IN the midst of the indignation aroused by the "cornering" operations which have lately been exposed in the chief center of our cotton trade, it was only natural that the telegraph should come in for some share of the blame. It is much easier, besides being safer, to reprobate a thing than to openly assail an individual; and while there is much righteous indignation exhibited against the wrong doers in general, it is aimed most directly at what are called the *facilities* for wrong doing. Foremost amongst these facilities undoubtedly stands the telegraph; and it is, therefore, roundly accused of being the prime instrument of a vast deal of financial plundering. We do not mince the word, for it is impossible to class the practices lately brought to light in the Cotton Metropolis among the legitimate operations of either trade or finance. What we demur to is that the telegraph is responsible. If the writer in this month's *Nineteenth Century*, who briefly treats on the subject of "corners," had been as explicit in his charges against the wielders of the inoffensive agent as he is against the agent itself we should have had no fault to find with him; but in effect he sets most of the mischief down to the tele-

graph, and people who take a pessimist view of affairs might consequently be inclined to wish the telegraph banished to the place where political economy is said to have gone, if the disorganization of the trade is the price we have to pay for it.

Of course Mr. Halhed, the writer of the article on "Commercial 'Corners'" we are referring to, does not go this length; nor probably is there anybody living seriously desirous of impairing our means of communication because they are liable to be used for sinister purposes. But it may be well to draw attention to the reverse of the picture, and while admitting that there is a seamy side of it, to claim for it what is rightly its due. There are some inventions which almost from the very first have suffered by reason of ugly associations. Dynamite and nitro-glycerine provoke a shudder at the mere mention of them these days, and even gun-powder must have had a bad time of it in the reign of James I. For the telegraph, however, everybody has had a kindly and grateful word to say until now; and although its mission is by no means jeopardized, we may be naturally jealous of its fair reputation.

There is no denying that this convenient and, for the most part, harmless invention has been made to serve very questionable practices. It is notorious that gambling on the turf has greatly increased under its ministrations, and that speculation on the Exchange has been fostered by its aid—it is probable, indeed, that both these branches of industry will go on increasing. Trading in "futures" is largely due to the growing rapidity with which news can be interchanged between the country where cotton is grown and those countries where cotton is wanted. The same process is threatened with regard to horse racing. An American paper lies now before us, and among news from "The Old World" we notice an item headed "Suspicions that Lorillard's Iroquois is being jockeyed," followed up by the intimation that "none of the [London] sporting papers *yesterday* name him as the winner." This was printed in America on the day of the St. Leger, and is accompanied by the latest London betting in detail. There is, therefore, some ground for apprehending that wherever and whenever it can, as in these cases, serve the ends of those idle persons who have plenty of wits and an overmastering greed after money, the telegraph will be liberally patronized by them. We cannot prohibit the adventurer from using the telegraph, and the telegraph cannot be blamed if that class of persons thrive and multiply. Possibly the moralist may find some consolation in the fact that the telegraph wires are made the vehicle for messages which are in the highest degree proper. The same paper we have just now quoted from informs the American public that, "the meetings of the Methodist Œcumenical Council" is "the overshadowing topic in London," and gives a great many particulars of this overshadowing topic which we on this side of the Atlantic had sinfully overlooked. We are also informed, or rather the American reading public are informed, of "The Irish People Becoming more Reconciled to the Provisions of the Land Act." In this case we have taken the evidence as read, contenting ourselves with the heading and its big capitals, lest our faith might be shaken. Nobody will take exception to such news at this, unless it be on the score that we who have a stake in the matter are forbidden to believe it. Glancing at the columns of telegraphic intelligence from this and every country in Europe, all up to date, we cannot but be gratified that our American cousins continue to take such a warm interest in us and our surroundings.

It would in all seriousness be idle to combat the notion that the telegraph is in the least degree an offender in this relation. Many foolish and improper messages are signalled by means of electricity, just as many unwise and unrighteous missions were undertaken on horseback before even stage-coaches were dreamed of. The fault is not in the machinery but in the human hands that set it going. The outcry against "cornermen" will, it may be hoped, do good service in awakening public conscience as to the true bearings of their transactions. They were no less iniquitous when they were fewer. That the telegraph has made them more numerous is not wholly to be regretted if public opinion, which moves but slowly, is at length brought to see their true enormity. When things get to their worst they are sure to mend is a saying that is true of the facts of life, though it does not content the impatient moralist. And if anything will hasten the bitter end, and land us quickly at that crisis which enables us to mend our ways, surely it is none other than the telegraph. The tolerance allowed to sins of small consequence will not be extended to those of great magnitude; and the telegraph more than anything else makes them grow hugely. For our part we are not sory that this should be the case. If, as Carlyle tells us, we want a new soul in matters commercial, the sooner we get it the better; and if the sins committed by the old Adam with the help of the telegraph induce us to put on the new Adam a few years earlier than we otherwise should do, the telegraph will deserve our gratitude. The true criminal is the unscrupulous user. He has made himself conspicuous, notorious, hateful by prostituting an innocent medium of social and commercial intercourse; and it may be hoped that the rope that has been given him without stint will speedily hang him without mercy.—*The Electrician.*

THE ELECTRIC SEMAPHORE.—WATSON'S NEW ELECTRIC SIGNAL.

The Provincial Exhibition at Montreal, held in the month of September, attracted large crowds of visitors. One of the most interesting objects for an editor of the *Railroad World* was an invention displayed among the machinery, and called "Watson's Electric Railway Semaphore Signal." Accidents on railroads arising from defective signalling are of far too common occurrence to allow us to neglect any contrivance which tends to lessen their number. The present system of railroad signalling is very defective. In the first place, the signal post is in many cases a great distance from the station, and very often is not visible from it. In the second place, it relies for its efficiency entirely on the switchman or signalman placed there to work it; on his vigilance and judgment the lives of thousands every day depend. Mistakes, too, will be made even by the most vigilant and careful of men. The task that has to be performed regularly day after day, for train after train, becomes at last mechanical. Long training and practice undoubtedly enables us to discharge a duty mechanically and yet successfully, but a day will come even to the best trained when something throws him off his balance. He will be a few seconds too late in working his signal; he will unthinkingly lay his hand on the wrong lever, and then the enterprising reporter has an opportunity to write some neat paragraphs with display heading—"Dreadful slaughter! Flight of the signal man. List of the victims."

This is a risk to which all of us who travel on railroads are exposed, and, therefore, the public ought to welcome any invention which renders such accidents preventable. As an accident is the most expensive amusement in which a railroad company can indulge, railroad men ought to examine studiously every possible or probable means of avoiding them, not merely to shield themselves from heavy responsibility, but for the sake of their dividends. How negligently signal duty is, too often, performed the series of accidents which took place a couple of months ago at Rye, on the New Haven line, gave fatal proof. Well managed as that line is, its system of signalling as laid down in its instructions was far from perfect, while in practice, it was found when a coronor's jury investigated the matter, these instructions were, we may say, systematically neglected. It is claimed for the Electric Semaphore that it obviates all the dangers at present likely to happen from devolving the duty of signalling to the humblest class of railroad employés. A few brief words will render the illustrations of it, which we present herewith, intelligible to the lay reader. It consists of the usual semaphore signal post, with arms, but the semaphore is connected by two ordinary telegraph wires, with an indicator and key placed in the depot, and which can be worked either by the telegraph operator or by the train despatcher. The arms of the semaphore revolve in the same manner and the same time as the hand of the indicator, and thus the operator can discover at a glance at what signal the lever stops. At each pressure of the key about an eight of a circle is described by the arm of the semaphore. The operation is repeated, by pressing down the key, till the required position is reached. The key to be pressed is a button similar to those attached to electric bells in hotels, the signal operates at once and at any distance, while the indicator in the office close beside the key tells him unerringly which of his three signals he has given. The arms assume three positions, as usual in all semaphores: Clear, Caution and Danger. By night, also, the usual methods are adopted. A disk, containing white, green and red glass, is placed before the signal lamp on each side of the light, and these are worked like the arms directly by the train starter. If, for example, the line is not clear, the glasses are moved till a red disk covers the lamp: the arm of the semaphore is in a horizontal position, and the indicator points to R, or red.

One of the commonest objections brought against many new inventions is that they are too complicated. This is as simple as ringing a bell. Another objection is that they are too expensive. This is not the case with the Watson Electric Semaphore. It costs less than the one now in use, nothing more being required than two ordinary telegraph wires instead of the heavy rods used in the present method: it is economical in working, as the signal can be worked by the depot operator, thus dispensing with the cost of a switchman. Moreover it is so constructed that the arms and lamps automatically indicate danger in the event of anything happening to the wires or the indicator, thus ensuring the greatest safety from accident. Another device to preclude carelessness on the part of any official is a contrivance by which the mechanism of weights moving the arms, can only be moved up after the lamps are lighted and the lamps can only be lighted while the mechanism is not run down. In all cases this semaphore is the cheapest for the reason we have stated: at small stations it would be invaluable. In them a switchman has several duties to perform, and this electric system connected immediately with the depot leaves him entirely free to discharge them.

On single track roads, by placing them between stations, collisions could be avoided by bringing the signal to danger after the train had left the station. A third advantage of Watson's system is that it can be used as successfully in winter as in summer, for

its action is not influenced by snow or ice on the wires. Anything that improves our system of signals, whether by semaphore, or by flags, or by whistles, or by gestures, deserves attentive consideration. That the semaphore we have described is appreciated in Canada is proved by the award of a Gold Medal to the inventor, Mr. Watson. Patents have been taken out for it in the United States and Great Britian as well as Canada.—*Illustrated R. R World.*

[From *Youth and Pleasure.*]

ENEMIES OF THE WIRE.—HOW WILD BEASTS, WORMS AND INSECTS CONSPIRE TO DESTROY THE TELEGRAPH.

If you will kick or pound on a telegraph pole, or place your ears against one on a windy day, what will the noise remind you of? A hive of bees? Precisely. So it does the bears in Norway. Bears are passionately fond of honey, and when, in one of the wild districts, bruin hears the humming of the wires, he follows the sound to the post where it is the loudest and begins to tear away the stones heaped around the poles in rocky soil to steady them in order to get at the hive which he imagines to be there. In his disappointment and disgust he usually leaves savage marks of his claws in the wood. Nor is he the only victim of the wires. In the electric exhibition at Paris they show the top of a thick pine telegraph post through which a woodpecker had drilled a hole several inches in diameter. The bird had apparently perched on the pole and taken the humming of the wires for the buzzing of a nest of insects in the wood, and had set himself manfully—or rather birdfully—to dig them out. Wolves will not stay in Norway where a telegraph line has been built. It was formerly the custom to protect farms by planting poles round them strung with cards something like rabbit snares, and gradually the wolves came to respect these precautions, so that a line stretched across the neck of a peninsula would protect the whole district. The wolves take the telegraph for a new and improved snare, and promptly leave the country when a line is built. On our own treeless plains the buffalo hails the telegraph pole as an ingenious contrivance for his own benefit. Like all cattle, he delights in scratching himself, and he goes through the performance so energetically that he knocks down the post. An early builder of telegraph lines undertook to protect the posts by inserting bradawls into the wood; but the thick-skinned buffaloes found the bradawl an improvement, as affording him a new sensation, and scratched down more poles than ever. In Sumatra the elephants are systematically opposed to telegraph lines, and at least twenty times a year make raids on them. In May, 1876, the elephants tore down the poles for a distance of several furlongs, and hid the wires and insulators in the cane jungle, and for three nights in succession they repeated the performance as regularly as the repairers built the line during the day. The monkeys and apes are about as formidable enemies, as they use the wires for swings and trapezes, and carry off the glass insulators as valuable prizes; then, when the repairer goes to correct the mischief, he may be pounced upon by a tiger, or driven up the post by a mad buffalo. In Japan the special enemies of the telegraph are the spiders, which grow to an immense size, and avail themselves of the wires as excellent frameworks for their webs. So thick are the cords the Japanese spiders spin that often, especially when they are covered with dew, they serve to connect the wires with each other or the ground, and so to stop them from working. In the sea the wires are not any safer, as a small worm has developed itself since cables came into fashion, which bores its way through iron wire and gutta-percha, lets in the water, and so destroys a line worth millions of dollars. When a great storm comes on in the centre of the ocean, and the cable breaks while it is being laid, or threatens to break, no one is alarmed. They fasten the cable to a buoy and come back afterward and pick it up, or if it is at the bottom of the sea they drop a dredge with a mile or so of rope and fish out the precious thread as large as one of your fingers, almost as easily as you would fish up a penny from the bottom of a tub of water with the tongs. But the little worm no bigger than a needle is more formidable than the elephant on shore or the hurricane at sea.

GUARDING AGAINST ELECTRIC LIGHTS.

The regular weekly meeting of the Polytechnic Association, a branch of the American Institute, in New York City, was held Thursday evening, Dec. 15th, 1881, the President, Mr. Stetson, in the chair.

Mr. Keith read the rules lately put in force by the Board of Underwriters of New York City, in regard to the manner of putting in electric light apparatus in buildings in this city, to avoid danger from fire. The rules go to an extreme of caution. Mr. Keith explained that the electric light companies already largely exceed the required conductivity, 50 per cent. excess. The smallest, even with the arc system, is No. 8 wire. It conducts the current without being appreciably raised in temperature. Heat is generated in a conductor when it is too small to carry the current freely. No. 16 is large enough; it will only raise the temperature to about 110 degs. Fah. With the incandescent system most companies use larger wire, up to No. 3. These wires are a fourth of a square inch in section. The electric resistance of a small wire absorbs and wastes power which otherwise would show itself as light at the lamps.

The case was analogous to passing water through pipes; a small pipe requires more head, or force, to cause the passage of a given quantity of steam, or any fluid, in a given time, and the working pressure at the delivery end is reduced by the wire-drawing.

Mr. Keith averred that the brick, or plaster walls and ceilings of a building are as good insulators as any insulating substance which can be put around the wires. Dry wood is nearly or quite as good. He thought there was no advantage worth considering in an insulating covering for wires on the ceilings; but such was important in places upon the floors or walls where there is a liability of some conducting substance touching both the inlet and the outlet wires.

Where the positive and negative wires run near together they should be well covered by some non-conducting substance, which will absolutely prevent accidental contact with both at one time. The rules were sound on that.

There is not a particle of danger in touching one wire with any substance at any place. All thought the practice of returning the current by the earth, or by connections to water or gas pipes, should be absolutely prohibited. Doing so makes all conducting substances in connection with the earth a return conductor.

CARS LIGHTED BY ELECTRICITY.

From the *London Times.*

A trial trip was made yesterday by the new Pullman car train, which will begin its regular service on the London, Brighton, and South Coast Line, between the Victoria Station and Brighton, on Monday, the 5th inst. Single cars of the American pattern have been running on this line for five or six years, but this train is made up entirely of Pullman cars. The train includes a parlor car, a drawing-room car, with ladies' boudoir and dressing room, a restaurant car, and a smoking car, while a compartment at each end of the train next to the luggage compartment is provided for servants. The cars are kept at an equable temperature by means of hot water pipes. There is electric communication between the parlor, drawing-room, and smoking cars and the restaurant car, and in many ways the comfort of passengers is provided for. The most important and novel feature of the new train is, however, that it is lighted throughout by electricity. As the train entered Box-hill and other tunnels on the Dorking, Horsham, and Steyning route, by which the trip to Brighton was made, the cars were simultaneously, and by the mere turn of a handle, brilliantly lighted, and as quickly, when the train emerged, the light was turned off. On the return journey the cars were lighted all the way from Brighton to Victoria, the lamps burning with a steadiness undisturbed by the motion of the train. The trial confirmed the results of an experiment made some few weeks ago with a single car, and proved the possibility of satisfactorily lighting a whole train by electricity. The lamps used yesterday were Edison's incandescent lamps, of which altogether there were 29 distributed in various ways throughout the train, the drawing room car being sufficiently illuminated with an effect of pleasantly diffused light by five of them. Each lamp was computed to be giving a light equivalent to that of nine or ten candles. As one of these Pullman cars is 58 feet 5 inches long, the length of train to be lighted was over 233 feet. The electricity was supplied by Faure accumulators, of which 80 were carried. Mr. W. Lachlan, the engineer representing the Societe La Force et La Lumière, who was in charge of the batteries, reported that but 30 were brought into use on the down journey, and only a portion of the electricity stored in these was expended. On the up journey these and four fresh boxes were brought into operation. For the present the accumulators will be charged each evening at the society's depot at Charing-cross, but as soon as the necessary arrangements can be made it is intended that the recharging shall be done at Victoria with a dynamo machine worked by a small stationary engine. It is not improbable, however, that before long the electricity required may be generated on the train itself, the chief practical difficulty in the way of this saving of force arising from the unavoidable alterations in the speed of the train—a mechanical difficulty in the way of charging the accumulators in this way which the ingenuity of the electrical engineers will no doubt soon overcome.

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *January* 1, 1882.

To all offices on Western Union lines:

NEW TARIFF BOOK.

Managers of offices at places where Western Union lines are connected with those of other companies should notify those in charge of such "other" lines of the change in method of computing tolls on *night messages* to and from Western Union offices.

THE JOURNAL of December 16, 1881, contains a number of changes and corrections which should be made in the new Tariff Book. The following have been made since December 16, 1881.

ALABAMA.
285 Wilhites, closed.

CALIFORNIA.
790 Antelope, closed.
769 Crescent Mills, closed.
806 Etna, closed.
800 Pacheco, closed.
761 Tahoe City, closed.

COLORADO.
557 Deansbury, closed.

CONNECTICUT.
37 Watertown, closed.

DAKOTA.
903 Lake Preston changed to 903 Preston.

FLORIDA.
187 Folkston, closed.

ILLINOIS.
338 Mulkeytown, closed.
310 Roland, closed.

INDIANA.
300 Chandler, closed.

KANSAS.
503 Cottonwood, P. O. Strong City.

KENTUCKY.
* Morehead now 45 3 Lexington, Ky., or 50 3 Huntington, W. Va. Erase "25 2 Mt. Sterling."
* Morganfield now 25 2 by telephone, Henderson. Erase "25 2 by telephone Mt. Vernon, Ind."
* Olive Hill now 50 3 Lexington, Ky., or 40 3 Huntington, W. Va. Erase "25 2 Mt. Sterling."
* * Springfield, now * Springfield, 25 1, by telephone, Lebanon.

LOUISIANA.
433 Marthaville, reopened.

MARYLAND.
103 Clear Spring, closed.

MASSACHUSETTS.
* * Cotoit now * Cotoit, 15 0 by telephone, W. Barnstable.
21 E. Somerville, Erase "Ck Fall River."
* * Marston's Mills, now * Marston's Mills 15 0, by telephone, W. Barnstable.
* * Osterville, now * Osterville 15 0, by telephone, W. Barnstable.

MEXICO.
The tariff for "other" lines to the places named below is now 75 and 7 from Brownsville, Tex.

Bagdad,	Laredo,	Reynosa,
Cadereyta Jim,	Linares,	Salinas Victoria,
Camargo,	Marin,	Saltillo,
Cerralvo,	Mier,	Villaldama,
Guerrora,	Monte Morelos,	Villagran,
Lampazos,	Monterey.	

MICHIGAN.
119 Onekama now * * Onekama. By mail, Manistee.
270 Robinson, closed.
119 Stronoch. Erase "Ck Manistee."

MINNESOTA.
886 Young America now checked direct.

MONTANA
* Miles City is now W. U. office, square 988.

NEVADA.
714 Pine Sta., closed.

NEW YORK.
110 Albion is in Orleans Co.
65 Cuyler, closed.
40 Olive Branch and Olive Bridge, closed.
65 Otselic, closed.
51 West Flats changed to 51 Rockland.

NORTH CAROLINA.
Gibson's Store. P. O. Laurel Hill.

OHIO.
242 Easton, on page 226 of Tariff Book, should read 242 Eaton.
170 Strasburg is in Tuscarawas Co.

PENNSYLVANIA.
59 Balto. Cent. Junc., P. O. Wawa.
66 Dreshersville, etc., now 66 Drehersville, etc.
151 Noblestown, closed.
59 Willow Grove is in Montgomery Co.
59 Wissahickon, now * * Wissahickon, 80 0 Manayunk, Phila. Co.

SOUTH CAROLINA.
* Union, now 80 2 Spartansburg. Erase the abbreviations ("N. M.")

TEXAS.
649 Burleson, P. O. Oak Grove.
* Black Jack Grove, now W. U. office, Square 510.
* Cleburne now (N. M.) 50 3 Galveston. Erase "50 3 Fort Worth."
* Daingerfield, now W. U. office, Square 470.
* Hughes Springs, now W. U. office Square 470.
* Lewisville, " " " " 648.
* Sulphur Springs, " " " " 479.
488 Thornton, closed.
* Winnsboro, now W. U. office, Square 470.
All other line offices in Texas, with "Tariff for other lines" from Galveston are now (N. M.) offices.

VERMONT.
* * Pawlet now * Pawlet, 15 2 Factory Point.

VIRGINIA.
153 Big Lick changed to 153 Roanoke.

SPECIAL RATES

Under the head of "Special Rates," in the circular of December 16, 1881, is a notice which directs that there must be no increase of special rates on the first of January, 1882. This order refers to "Sheet K" and other rates lower than the old State and Square rates which may be found to be below the new State and Square rates; it also covers special rates from "Sheet K" offices to offices in Ontario and Quebec and those from "Sheet K" offices to Adams, Alexandria Bay, Cape Vincent, Chaumont, Clayton, Mexico, Ogdensburg, Pulaski and Watertown in New York.

Night Messages between offices which have to each other a special rate should, unless otherwise ordered, be charged for as per the table of Night Message Rates in the new Tariff Book.

ATLANTIC CABLE.

The cables between Wladiwostock and Nagasaki, and between Amoy and Shanghai are interrupted; pending the repair of the Amoy and Shanghai cable, messages for Shanghai and Japan will be sent by Post from Amoy or Hong Kong. Charge Falmouth rate until further notice.

The cable between Santa Catherina and Rio Grande do Sul, South America, repaired.

CUBA CABLE.

The cable between Trinidad and Demerara interrupted. Messages will be sent by best means during interruption.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in double columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

ALABAMA.

285 Bangor.	293 Falkville.
294 Calera.	324 Prichards.
323 Epes.	266 Stock Mill.

* Ft. Morgan, 75 5 Mobile.
* Gainesville, 25 2 Epes.
* Point Clear, 50 3 Mobile.

ARIZONA.

659 Holbrook.	659 Winslow P. O. Brigham City.

ARKANSAS.

391 Jacksonport.	449 North Brook.

COLORADO.

546 Agate.	590 Holleys.
565 Boreas.	599 Hortense.
540 Buffalo, Weld Co.	623 Hot Springs.
623 Calumet.	634 Ignacio.
552 Carr.	540 Liff, P.O. care Big Spring, Neb.
545 Deuel, P. O. Morgan.	
541 First View.	557 Red Cliff.
546 Godfrey, P. O. care Deer Trail.	628 Sargents.
545 Hardin, P. O. care Evans.	558 South Pueblo, Ck. Pueblo.

CONNECTICUT.
* Naubuc, 80 3 Hartford.
* Noroton, 10 0 by telephone, Stamford.
* Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

915 Chamberlain.	898 Montrose.
947 Dickinson.	920 Northville.
890 Hillsboro.	915 Ordway.
926 Hitchcock.	903 Preston.
895 Mayville,	

* Crook City, 50 2 by telephone, Deadwood.
* Pine Ridge Agency, 150 9 Cheyenne Wy.
* Rosebud Agency, 175 10 Cheyenne, Wy.
* Spear Fish, 50 2 by telephone. Deadwood.
* Sturgis City, 50 2 by telephone, Deadwood.

FLORIDA.
* Highland, 50 4 Lake City.
* Moocasin, 50 3 Lake City.
* Paola, (N. M.) 100 6 Lake City,

GEORGIA.

207 Dubois.	216 Lula.
246 East Point.	227 Oglethorpe.
187 Folkston, P. O. Centre Village.	

* Abbeville (N. M.) 40 3 Ft. Gaines.
* Arlington, 40 3 Ft. Gaines.
* Blakely, 40 3 Ft. Gaines.
* Senoia, (N. M.), 25 2 Newnan.

ILLINOIS.

300 Allendale.	329 Belknap.
307 Apine.	337 Breckenridge.
328 Beecher City, Effingham, Co.	347 Oakford.
	337 Rockville.

INDIANA.

280 English Lake.	262 Milroy.
253 Letts Corner.	290 Paxton.
298 Lowell.	253 Westport.

* * Ferdinand. By mail, Ferdinand Station.
* * St. Meinrad. By mail, Ferdinand Station.

IOWA.

367 Buffalo.	407 Laurel.
425 Dakota City.	397 Libertyville.
367 Fairport.	367 Montpelier.
416 Galt.	455 North Boro.
407 Girard.	473 Salix.
425 Irvington.	407 Van Cleve.
454 Irwin.	426 West Bend.
435 Lake City.	425 Willow Glen.

KANSAS.

517 Alum Creek.	514 Galva.
456 Argentine.	506 Hazelton.
466 Barclay.	503 Horton, P. O. care Emporia.
527 Cleveland.	
517 Clifton.	475 Wakarusa
527 Collyer.	466 Westphalia.

* * Cottonwood Falls, 50 0 Cottonwood.
* Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

263 Bloomfield.	263 Finchville.
263 Crescent Hill.	263 Taylorsville,

* Clay Lick, 25 1 by telephone, Worthville
* Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Huntington, W. Va.
* Eastern Junc., 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
* Flemingsburg. 15 2 by telephone, Johnson Junc.
* Gistville, 25 1 by telephone, Worthville.
* Gratz, 25 1 by telephone, Worthville.
* Lockport, 25 1 by telephone, Worthville.
* Marion, 15 1 by telephone, Worthville.
* Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
* Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
* Port Riffe, 25 1 by telephone, Worthville.
* Rush, 50 3 Lexington, Ky., or 30 2 Huntington, W. Va.
* Springport, 20 1 by telephone, Worthville.

LOUISIANA.

424 Eola.
424 Garlord.
442 Grand Cane.
354 Lookout.
434 Mermenteau.
383 Mounds Sta.
442 Pleasant Hill.
433 Provencal.
433 Robiline.
442 San Patrice.
442 Stonewall.
444 Whitesville.

* Millikens Bend (N. M.), 40 3 Tallulah.
* Plaquemine, 50 3 New Orleans.
* St. James, 50 3 New Orleans.
* Vacherie, 50 3 New Orleans.

MARYLAND.

67 Edgewood.
54 Pocomoke Station.

MASSACHUSETTS.

21 Conway.
21 Wellesley Hills.

* Bass River Harbor, 05 0 by telephone, So. Dennis.
* Cochesett, 25 0 by telephone, East Bridgewater.
* Hyannisport, 15 0 by telephone Hyannis.
* Lunenburg, 10 0 by telephone, Fitchburg.
* * Matfield, 50 0 East Bridgewater.
* * Melrose Highlands, 25 0 Melrose.
* South Mills, 10 0 by telephone, New Bedford.
* Wrentham, 35 0 by telephone, Providence, R. I.
* West Bridgewater, 15 0 by telephone, East Bridgewater.

MEXICO.

* * Paso del Norte, 05 0 El Paso, Tex.

MICHIGAN.

220 Beech.
281 Bridgewater.
210 Brockway Centre.
119 Free Soil.
127 Indian River.
231 Jerome.
210 Mariette.
210 Mayville, P. O. May.

MINNESOTA.

190 Argyle.
865 Arlington.
865 Hamburg.
889 Kennedy.
890 Muskoda.
870 Oshawa.
869 Rock Island Quarry.
876 Vernon Centre.
865 Waconia.

MISSISSIPPI.

* Arcola, 80 6 Vicksburg.
* Johnsonville, 80 6 Vicksburg.
* Stoneville, 80 6 Vicksburg.

MISSOURI.

457 Ellis.
369 Etlah.
428 Montserrat.
398 Shabbyville, Ck. Shelbina.

* * Augusta, By mail, Labadie.
* Purdin, 25 2 Unionville.

MONTANA.

957 Fallon.
957 Keith.
957 Milton.
583 Silver Bow June. P. O. care Butte City.

NEBRASKA.

927 Atkinson.
* Benkleman, (N. M). 60 4 Plattsmouth.
* Liberty, (N. M.), 35 2 Plattsmouth.
922 Long Pine.

NEW BRUNSWICK.

8 Lake Ha Ha.
8 St. Louis.

NEW HAMPSHIRE.

20 Livermore.

* Chesterfield, 25 0 by telephone, Brattleboro, Vt.
* Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
* North Hinsdale, 20 0 by telephone, Brattleboro, Vt.

NEW JERSEY.

41 Brick Church. Tariff same as Orange.
41 Centreville, Passaic Co.

NEW MEXICO.

687 Gallup. P. O. care Wingate.
632 Monero.
630 San Antonio.

NEW YORK.

64 Albion Station Oswego Co. Ck. Sand Bank.
65 Apalachin.
51 Fish's Eddy, Delaware Co.
83 Nichols.
51 Rockland.
65 Vestal.

* Minisink, Orange Co., 15 1 Port Jervis.

NORTH CAROLINA.

173 Newton.

* Falkland, (N. M.), 25 2 Tarboro.
* Pactolus, (N. M.), 40 3 Tarboro.

OHIO.

221 Alvada.
180 Everett, Summit Co.
204 Hadley Junction. P. O. Thurston,
221 Luckey.
221 McClure.
180 New Berlin, Stark Co.
159 Strasburg, Stark Co. P. O. Maximo.
213 Wheelersburg.

* Hayesville, Ashland Co., 15 1 by telephone, Ashland.
* Monroe Centre, 20 2 No. Kingsville.
* Pierpont, 25 2 No. Kingsville.

PENNSYLVANIA.

140 Corsica.
122 Elk Lick.
151 Etna, Allegheny Co.
140 Evansburg, Butler Co. P. O. Breakneck.
151 Fallston.
111 Sedgbird. P. O. care Custer City.
131 Stonerville.
59 Virginsville. Ck. Moselem.
151 Willow Grove, Allegheny Co.
140 Zelienople.

* Academy Corners, 15 1 by telephone, Lawrenceville.
* Cowanesque Valley, 20 1 by telephone, Lawrenceville.
* Harrison Valley, 20 1 by telephone Lawrenceville.
* Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
* Nelson, 10 1 by telephone, Lawrenceville.

QUEBEC.

Beauce June.
Eutis.
Hu'ets Landing.
St. Alphonse de la Grand Boie.

TENNESSEE.

292 Bellevue.
292 White Bluffs.

TEXAS.

The Squares omitted will be given in the next JOURNAL.

Antelope *(South)*.
479 Bagwells.
Borocho *(South)*.
652 Bremen *(South)*. P. O. care Baird.
Carlso Pass *(South)*.
485 Clear Creek.
495 Cuero *(South)*.
655 Metz *(South)*. P. O. care Big Springs
San Martin *(South)*.
657 Sierra Blanca *(South)*. P. O. care Toyah.
648 Trinity Mills
470 Wayne.
500 West.
Wildhorse *(South)*.

* Benavides, 25 2 Corpus Christi.
* Kounts, 35 2 Beaumont.
* San Diego, 2532 Corpus Christi.
* Village, 40 2 Beaumont.

VERMONT.

39 South Wallingford.

* E. Rupert, 15 2 Factory Point.
* Guilford, 10 0 by telephone, Brattleboro.
* Hartwellville, 20 1 by telephone, No. Adams, Mass.
* Jacksonville, 25 2 by telephone, No. Adams, Mass.
* North Stamford, 15 1 by telephone, No. Adams, Mass
* Readsboro, 20 1 by telephone. No. Adams, Mass.
* Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
* Sadawga, 25 2 by telephone, No. Adams, Mass.
* Stamford, 15 1 by telephone, No. Adams, Mass.
* Wells, 15 2 Factory Point.
* West Dover, 25 0 by telephone, Brattleboro.
* Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

153 Roanoke.

* Lairds, (N. M.), 40 3 Richmond.

WISCONSIN.

852 Haywood.
839 Kempster.
356 Livermore.
856 Livingston.
306 Spring Meadow. P. O. care Wauwatosa.
852 Superior June.
839 Summit Lake.

NORVIN GREEN,
President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *Dec.* 29, 1881.

To all Transfer Agents and offices.

On January 16th, 1882, Streator, Ills., in Charles Catlin's District, will be advanced from Class C to Class B.

NORVIN GREEN,
President.

December 31*st*, 1881.

To Superintendents and Managers of the International Ocean Telegraph Company:

The International Ocean Telegraph Company having made the Western Union Telegraph Company its agent for the management and operation of its property and business, and that company having undertaken such management and operation from and after this date, you will report to and receive orders from the officers of that company.

J. O. GREEN,
Vice President.

GOLD AND STOCK TELEGRAPH COMPANY,
WESTERN UNION BUILDING.
NEW YORK, *December* 31*st*, 1881.

To all agents of the Gold and Stock Telegraph Company:

The property and business of this company having been turned over to the Western Union Telegraph Company, from and after this date you will report to and receive orders from the officers of that Company.

J. O. GREEN,
Vice President.

WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *December* 14, 1881.

DIVIDEND No. 58.

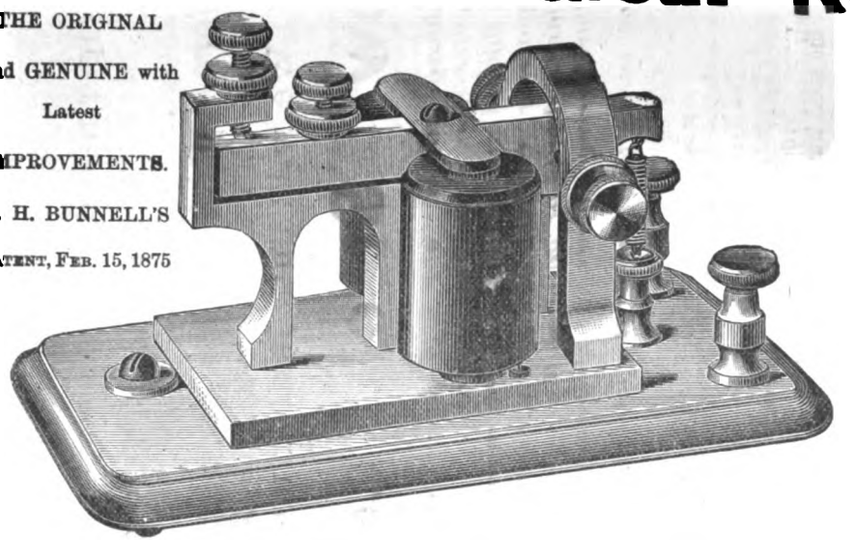
The Board of Directors have declared a quarterly dividend of ONE AND ONE-HALF PER CENT. upon the capital stock of this Company from the net revenues of the three months ending December 31st, instant, payable at the office of the Treasurer on and after the 16th day of January next. to shareholders of record on the 20th day of December, instant

The transfer books will be closed at three o'clock on the afternoon of the 20th of December. instant, and re-opened on the morning of the 17th of January next.

R. H. ROCHESTER,
Treasurer.

Another Great Reduction in Prices!!

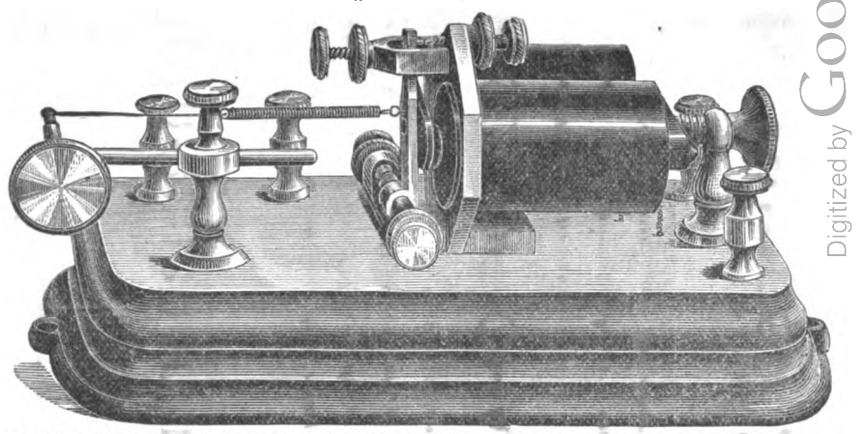
THE ORIGINAL and GENUINE with Latest IMPROVEMENTS. J. H. BUNNELL'S PATENT, FEB. 15, 1875



THE GIANT SOUNDER—UNEQUALLED! $4.00.

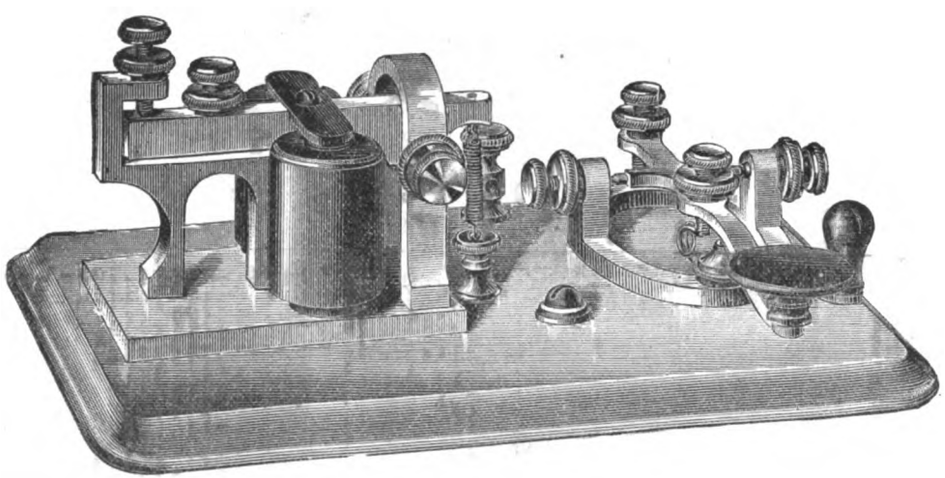
We call attention to the fact that we are making these unrivalled Sounders our own original invention, with our latest improvements added, at a lower price than has ever before been reached. Every Sounder warranted first-class in all respects, and with loud and clear tone. PRICE $4.00, carefully boxed and sent by mail, prepaid, to any part of the United States.

$7.50.



FIRST CLASS MAIN LINE RELAYS. WESTERN UNION STANDARD.

150 ohms resistance, Silk-Covered Wire, Polished Rubber-Covered Coils, Mahogany Base, mounted on Ornamental Surbase, Extension Adjustment. Price, $7,50.

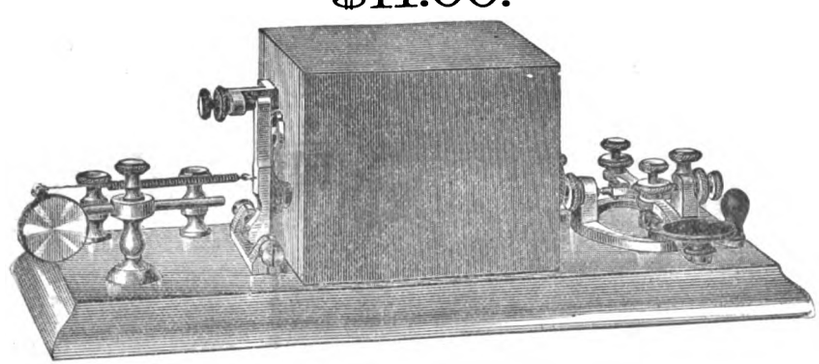


GIANT SOUNDER, (20 OHMS RESISTANCE) AND STEEL LEVER KEY.

COMBINATION SET: $7.50.

For Private Wires, Main Lines, etc., up to 25 miles in length—Warranted—consists of our standard first-class Giant Sounder, finely finished, with Rubber-Covered Coils, fine Silk-Covered Wire, wound to 20 ohms resistance, mounted on Polished Mahogany Base, with a Steel Lever Key, making the prettiest and most perfect set of short Main Line Instruments ever produced. PRICE 7.50, carefully boxed and sent by mail, prepaid, to any part of the United States.

$11.00.



BOX SOUNDING RELAY AND STEEL LEVER KEY.

COMBINATION SET.

For Main Lines up to 600 miles in length. Of best construction for loud, clear sound without loc sounder. Polished Mahogany Box and Base; 150 ohms Silk Wire.
Price, with Steel Lever Key on base, $11.00; without Key, $8.50.

All of these prices subject to liberal discount on orders in quantity.

☛Send for estimates if you want low prices and first-class apparatus.☚

J. H. BUNNELL & CO., TELEGRAPH AND TELEPHONE SUPPLIES, 112 LIBERTY STREET, N. Y.

JOURNAL OF THE TELEGRAPH

VOL. XV. NEW YORK AUGUST 20, 1882. WHOLE NO. 350.

(From Wiedemann's Annalen.)

ON THE ELECTRIC RESISTANCE OF THE GASES.

By E. Edlund.

It appears that the electric resistance of gases is in many respects different from that of solid and liquid bodies. We shall here consider these differences and attempt to give their explanation.

1. In order that the current of an electro-motor may traverse a liquid or solid conductor, it is by no means necessary that the electro-motive force should possess a certain strength. However small such force may be the current passes through the conductor, although the strength of the current decreases in proportion as the electro-motive force is reduced or the resistance increased. The current ceases only with the electromotive force. With gases the relation is quite different. If the current is to traverse a gaseous body the electromotive force must produce a certain tension at the electrodes, the magnitude of which depends on the nature, the density, and the temperature of the gas, and which must not fall below a certain limit. If the tension falls below this limit the gas appears as a perfect insulator.

2. The quantity of heat which the current produces in a solid or liquid body is well known to be proportional to the square of the strength of the current. In gases, however, this quantity of heat is as the first power of the strength of the current. (See *Pogg., Ann.*, 145, p. 237, and *Wiedemann's Beiblätter*, 2, p. 720.)

3. In solid and liquid conductors the quantity of heat developed by the current is, other things being equal, inversely as the section of the conductor. In gases the heat-quantity is quite independent of the section of the gaseous column traversed.

4. In solid and liquid bodies the resistance is inversely as the section of the conductor. Wiedemann has shown experimentally that the tension at the electrodes which is necessary to send the electricity of a Holtz machine through a cylindrical tube filled with diluted gas does not depend on the diameter of the tube, the resistance of the gas being independent of the section of the gaseous column. Schultz had previously observed that the tension was almost the same in two tubes, one of which was 0 5 and the other 16 mm. in diameter.

5. In solid and liquid conductors the difference between the electroscopic tensions at two points of the conduction is proportional to the resistance between these two points multiplied by the strength of the current. Warren de la Rue and Hugo Müller have shown, on the other hand, that the tension in expanded gases is quite independent of the strength of the current. These physicists caused the strength of the current to vary between wide limits without being able to perceive the slightest difference in the tension. Hittorf came to a similar result by another process, and concluded prematurely that the resistance of a gaseous column must be inversely proportional to the strength of the current.

6. Some years ago E. Becquerel showed that the gases become conductive when raised to the temperature of redness. The current of a single element can traverse the gaseous column if the temperature is sufficiently high. Becquerel has drawn from his researches another conclusion, to which we must draw attention. If the strength of the current traversing a gaseous column is caused to vary by the introduction of various rheostatic resistances, the resistance of the gaseous column seems to be inversely proportional to the strength of the current. If E is the electromotive force of the electro-motor, i and i_1, the strengths of the current, r and r_1 the resistances of the solid and liquid conductors introduced into the track of conduction, and z and z_1 the resistances of the gaseous column corresponding to the two intensities of the current, Becquerel, according to Ohm's law, puts

$$i = \frac{E}{r + z} \text{ and } i_1 = \frac{E}{r_1 + z_1}$$

If the gaseous column is shut out of the circuit, and if M and M_1 are the resistances which must be introduced in order to obtain the intensities of the current i and i_1, we have

$$i = \frac{E}{M} \text{ and } i_1 = \frac{E}{M_1}$$

Hence it follows that $M - r = z$, and $M_1 - r_1 = z_1$. If the calculation is carried out thus, we come really, as Becquerel's experiments prove, to the curious result that the resistance of gases is inversely proportional to the strength of the current.

The differences between solid and liquid bodies on the one hand, and gaseous bodies on the other, can be readily explained upon the unitary theory of electric phenomena proposed by the author.

The circumstance that the electromotive force, or the electric tension on the electrodes, does not require to exceed a certain limit in order that the current may traverse a solid or liquid conductor is due, according to this theory, to the fact that the true resistance which those conductors oppose to the current is proportional to the strength of such current. The demonstration of this law no longer applies in the case of gaseous bodies. As already remarked, in gases the electric tension must have a certain value, according to each case that the current may penetrate. The resistance of the gases cannot therefore be proportional to the strength of the current; nor can we assume, with Becquerel or Hittorf, that the resistance is inversely proportional to the strength of the current, otherwise the resistance of a gaseous column traversed by an infinitely small current would be excessively great. In an electric discharge, or in a closed galvanic circuit, the current is at the first moment infinitely small. Hence it would follow that the resistance at the same moment would be so great that the formation of the current could not take place. We must therefore assume that in gases—provided that the current occasions no change of temperature, &c.—the resistance is independent of the strength of the current.

According to the unitary theory the resistance is determined by the pressure which the conductor exerts upon the unit section in opposition to the propagation of the electric current. We denote this counter-pressure in a column of gas, the section and length of which are equal to unity, by k. In a column of the section a, the whole counter-pressure against the transmission of the steam $= k\,a$. (In a liquid or solid body the entire counter-pressure $= k\,i$, i signifying the entire strength of the current, and k the resistance for the unit of the strength of the current.) If h is the speed of propagation of the current, *i.e.*, the distance which it traverses in a unit of time, i the strength of the current, and δ a constant common to all bodies, we have, according to the theory, $i = \delta\,a\,h$. If $k\,a$ is multiplied by h, or $\frac{i}{\delta\,a}$, the product $\frac{k\,i}{\delta}$ is proportional to the mechanical work performed by the current in the unit of time; and if this product is multiplied by the heat-equivalent of the unit of work, we obtain an expression proportional to the quantity of heat evolved in the unit of time. It follows, therefore, from the theory that this quantity of heat is proportional to the strength of the current, but independent of the diameter of the gaseous column.

As to the resistance is determined by the pressure which the conductor opposes per unit of section to the propagation of the current, and as in gases this counter-pressure is independent of the strength of the current, it is evident that the resistance has nothing to do with the magnitude of the section.

The difference between the electroscopic tensions at two points of the conductor of a current is, according to the unitary theory, proportional to the real resistance of the conductor between these points. As this resistance in gases is independent of the strength of the current, this must also be the case with the difference of the electroscopic tensions.

If r is the essential resistance in a closed circuit consisting merely of solid and liquid conductors, L the length of track of conduction, n the section of the polar plates, E the electromotive force, and i the strength of the current, we have, according to the unitary theory for calculating the strength of the current, the differential equation,

$$L\frac{di}{dt} = n\,E - n\,r\,i,$$

from which we obtain by integration Ohm's law

$$i = \frac{E}{r}$$

(Continued on page 167.)

Journal of the Telegraph.

PUBLISHED MONTHLY, ON 20TH OF EACH MONTH, AT 195 BROADWAY.

THE JOURNAL is issued on the 20th of each month. Its circulation is over 12,400, and is steadily increasing. It goes to every State, Territory and Province on the Continent, and is delivered to every office of the Western Union Telegraph Company, which now exceeds 10,730 in number. Hence it is the best advertising medium of its class in the World.

TERMS OF SUBSCRIPTION.

Invariably in advance.

One Copy, one year, postage included..... $ 1.50
One Copy, six months, postage included..... .75
Single Copies, 15 cents.

ADVERTISING RATES.

One Inch space—each insertion..... $ 2.00
Half Inch " " 1.00
Quarter Column, " 4.00
Half " " 8.00
One " " 16.00

Cuts charged for according to space occupied.

Business Notices, on Editorial page, 50 cents per line, for each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, AUGUST 20, 1882.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *August* 10, 1882.

IN addition to the list published in the JOURNAL of February 1st, giving the names of the places at which American Union franks for 1882 are good, add the name of Lackawanna and Bloomsburg Junction, Pa.

THOS. T. ECKERT,
General Manager.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *August* 17, 1882.

BUSINESS franks Nos. M. 903, on account Canada Southern Ry., N. 835, Wabash, St. L. and Pacific Ry., N. 806, N. York, Ontario and Western Ry., 855, St. Louis and San Francisco R. R., N. 809, East Tenn., Va. and Ga. R. R. and M. 288, Delaware, Lack. and Western R. R., have been reported lost.

Managers are requested to take them up on presentation and return to this office for cancellation.

JNO. VAN HORNE.
Vice President.

TELEGRAPH SCHOOLS.

THIS subject is ever one of importance to telegraph operators as well as to those who contemplate becoming such at some future time. The peculiar education needed for the good qualification of an operator can only be acquired by experience, and the prevailing questions of aspirants are how and where can this be had if they are debarred the observation and use of instruments in a telegraph office, where new beginners are not permitted to enter? Offices on regular telegraph lines cannot be bothered by mere learners, and the office rules will not permit it. The office is the best place to learn, and the next best place is a good telegraph school or a private instructor, which is on the same principle.

Such a school, like any other good school, may be difficult to find, but they exist nevertheless; so do poor schools of that character, but it is for the interest of all instructors that they should be as practical and thorough as the ability of the instructors can devise. There are many of them worthy of the confidence of those who contemplate becoming telegraph operators.

Much can be learned by self instruction, and there are many instances where persons have become fair operators by the use of instruments and lines improvised for the purpose, with the aid of a book of instructions for beginners, but a school is generally preferable, and the student should also try to learn all he can outside of that, so that if he has an opportunity he may be far enough advanced to take some place where thorough knowledge is not required or expected from him. In large cities there are many private lines where such an operator will be gladly accepted.

Those who contemplate attending a telegraph school should soon begin to be about it, as they usually open in the early autumn.

THE editorial notice of the recent great work by William R. Plum, LL.B., in two volumes, giving the history of the Military Telegraph during our Civil War, is deferred for want of time and space to give a proper notice of it. We hope to be able to do so in our next issue.

THE ORIGIN OF THUNDERSTORMS.

ON the 7th of July, Mr. B. G. Jenkins, F.R.A.S., read an interesting paper on this subject at a meeting of the Dulwich College Geological Club, held at the Old College. According to the author a thunderstorm is generally regarded as a manifestation of atmospheric electricity. Electricity is without doubt actively present, but its duty is, he maintained, largely to act as a match to produce the chemical unions of which the thunder is the audible effect. If a thunderstorm is the result of an excess of electricity in the atmosphere, it is remarkable that they should be so prevalent in June, when the atmospheric electricity is at a minimum, and not happen in January, when it is at a maximum. That moisture is not the cause of thunderstorms is evident, for moisture in the winter months increases atmospheric electricity, but diminishes it in summer. Besides, thunderstorms are much fewer in number and less violent over the oceans than over the continents. The vast quantities of water in the rapidly-formed thunder clouds are the effect and in no way the cause of the storm. Count Volta showed that gases emit positive electricity when being condensed, and in this and the consequent rapid formation of dense clouds Mr. Jenkins considered the true explanation lay. The condensation was due to a chemical change produced in the union of the oxygen and nitrogen of the atmosphere with hydrogen. The two former are abundant; the difficulty is to account for a large and sudden supply of the latter. There are, however, reasons for believing that the outside layer of our atmosphere is largely composed of hydrogen, and that under certain atmospheric conditions portions of this vast layer are whirled down into the mixture of oxygen and nitrogen around and above us. The mere friction of the particles would be sufficient to produce an electric spark, causing a large portion of the hydrogen to unite with oxygen, forming water; another to unite with nitrogen forming ammonia; and another to unite with oxygen and nitrogen to form nitric acid. Each great flash is followed by a sudden downpour of rain, and especially of hail, indicating by the great change of temperature some vast chemical union. This can be no other than the formation of water, which, as is well known, would be accompanied by flame and explosion. The light produced in the sky during a thunderstorm has been divided into three kinds—first, forked lightning; second, sheet lightning; third, ball lightning. The first only of these, he held, was true electricity. The second is the most frequent, and appears to be produced inside the cloud, lighting up the mass, being almost wholly flame, due to the combustion of hydrogen in oxygen, and other chemical changes—the thunder being not so much the noise of the electric discharge as the report of the explosions taking place during the chemical union. Ball lightning is probably not electricity, but a mass of gas in intense ignition. The comparative harmlessness of the last two would seem to indicate their non-electric character.

TRANSMISSION OF ELECTRICAL POWER.

EXPERIMENTS hitherto made on the transmission of power by electricity have always been over short distances, and by means of cables of exceptionally low resistance. From six to eight-horse power of work is the maximum amount that has been transmitted over distances upwards of three miles. Mr. Marcel Deprez has, however, quite recently made some interesting experiments which point to greater achievements in the near future. With Gramme machines of the small type, weighing about 220 pounds, modified in accordance with the principles which he has already indicated, he obtained a useful work of about 260 foot-pounds (37 kgm.); the resistance interposed between the motor and the receiver being 786 ohms, representing a distance of about 50 miles of ordinary telegraph wire. This was effected without any sparking at the brushes, and in keeping the machine quite cool, while there were no special precautions taken to insulate the conductors. The yield or rendering of work was 25 per cent., but M. Deprez hopes to increase this efficiency in subsequent experiments.

Tariff Bureau.

MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *August* 20, 1882.

To all offices on Western Union lines:

CHANGES.

The following changes which have been made since July 20, 1882, should be entered in the Tariff Book as they will not be republished.

ALABAMA.

267 Mott's Mill, reopened.

CALIFORNIA.

790 Franklin, S. Co., closed.
790 New Hope, reopened.

COLORADO.

554 Apishapa, reopened.

DAKOTA.

947 Cantonment, changed to 947 Little Missouri.

FLORIDA.

* * Enterprise, now by mail from Sanford. Erase "75 0 Sanford."

315 Millview, reopened as * Millview, 25 2 Pensacola.
* Sorrento, closed.

GEORGIA.

* * New Holland Springs, now * New Holland Springs, 10 0 Gainesville.
* * White Sulphur Springs, now * White Sulphur Springs 25 0 Gainesville.

ILLINOIS.

307 Auburn, Cook Co., closed.
* Blunt, changed to * Big Rock.
357 Lennox, W. Co., changed to 357 Larchland.
310 Roland, reopened.

IOWA.

366 No. McGregor, closed.
396 Wells, changed to 396 Wellsburg.

KENTUCKY.

* * Dover, now 100 0 Ripley, O.
291 Owensboro Junc., changed to 291 Central City.
233 Silver Lake, changed to 233 Earlinger.

LOUISIANA.

* Coushatta, reopened. 50 3 Prudhomme. Erase "50 4 Minden."

Until further notice Farmersville business will be sent and checked via Monroe. No change in "other" line rate.

403 Trenton, closed.

MAINE.

16 Phillips, closed.
16 Strong, closed.

MARYLAND.

* * Ocean City, now 54 Ocean City, Summer office.

MASSACHUSETTS.

25 E. Douglass, reopened.
* * Atlantic House, Beachmont Sta., Pavilion House and Robinson Crusoe House, given under Revere Beach in Tariff Book, are now 25 0 by telephone, from Chelsea. Other places on the Beach 50 cents.

MEXICO.

* Monterey 124 11 Brownsville, Tex., or 50 4 Laredo, Tex.
* Salinas Victoria 149 11 Brownsville, Tex., or 50 4 Laredo, Tex.

MICHIGAN.

260 Colwell, closed.
220 Hamilton, Genesee Co., changed to 220 Swartz Creek.
* * Mackinaw or Mackinaw Island, now 25 0 special delivery or mail Mackinaw City. Erase "by mail Cheboygan."

MISSISSIPPI.

* Refuge, closed.

MISSOURI.

429 Aurora is in Lawrence Co.
418 Bedford, closed.
* Jackson, Cape G. Co., reopened. Tariff for "other" lines 25 2 Cape Girardeau.

NEW BRUNSWICK.

3 Bloomfield, closed.

NEW HAMPSHIRE.

Greenland, Rye and Stratham now each 1.50 delivery from North Hampton.

NEW JERSEY.

52 Middle Valley. Ck. German Valley.

NEW YORK.

* Bloomville and Hobart now 25 2 from Delhi only. Erase the Stamford route.
40 Browns Sta. is in Ulster Co.
37 Croton Lake, closed.
45 Harts Falls, closed.
40 Lebanon Springs, reopened.
45 Schaghticoke, earase the words "Ck. Harts Falls."

The following are delivery charges from West New Brighton to the places named:

Bulls Head,	50 0	New Springville,	75 0
Elm Park,	25 0	Port Richmond,	15 0
Graniteville,	50 0	Trovisville,	75 0
Mariners Harbor,	50 0		

NORTH CAROLINA.

Gibson's Store is now 125 Gibson's Store. P. O. care Laure. Hill. Erase "25 cents more than Old Hundred, etc."

OHIO.

170 Belmont, reopened.
151 Goulds, closed.
242 Harrisburg, Montgomery Co., closed.
* W. Elkton, closed.
* Spencer's is in Guernsey Co.
* Winchester, Preble Co., closed.

The following changes in telephone charges from Ironton, O., have been made:

Bartel's Station,	25 2	Mt. Vernon Furnace,	25 2
Buckhorn Furnace,	30 2	New Castle Coal Mine,	25 2
Burlington, Lawrence Co.,	25 2	Ohio Furnace,	25 2
		Olive Furnace,	30 2
Bradrickville,	25 2	Proctorsville,	25 2
Centre Sta.,	25 2	Pine Grove Furnace,	25 2
Etna Furnace,	25 2	Rockwood,	25 2
Hecla Furnace,	25 2	South Point,	25 2
Lawrence Furnace,	25 2		

PENNSYLVANIA.

151 Finleyville, reopened.
85 Gettysburg Springs, reopened.
66 Llewellyn, closed.
141 Lemont closed.
* * Newberry, L. Co., now 84 Newberry, L. Co.
* Shippack, should read * Skippack.

Erase from the Tariff Book the words, "Tariff same as Philadelphia," printed after each of the following: Belmont, Phila. Co., Chestnut Hill, Frankford, Germantown, Germantown Junc, Hestonville, Manayunk, Phila. Co., Paschalville, Port Richmond, No. Phila. Drove Yards and Tioga, Phila. Co.

SOUTH CAROLINA.

165 Grahamville, changed to 165 Ridgeland.

TEXAS.

654 Carson, reopened.
491 Morales, closed.
480 Oakwoods, reopened.

The office at Longview, Tex., was destroyed by fire. Managers of offices which exchanged messages with Longview between July 1st and 14th inclusive, are requested to send Longview copies of such messages.

VIRGINIA.

* * Chincoteague Island, now * Chincoteague Island, 25 1 Philadelphia, Pa.
108 Jordans White Sulphur Springs, reopened as * Jordans White Sulphur Springs, 25 2 Winchester.
* Riverville, closed.
153 Sweet Chalybeate Springs, reopened.

WEST VIRGINIA.

* Cassville, now * * Cassville, 25 0 Louisa, Ky.

WISCONSIN.

316 Fayette, closed.

OFFICES HAVING SPECIAL SHEET "L"

Will erase Cornwall, N. Y., Meshoppen, Milan, Wyalusing and Wysauking, Pa., from sheet "L" and charge thereto the Square or State rates; they will also add Auburn, Ind., to sheet "L" and make rate thereto same as to Auburn Junc., Ind.

CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY

OPENING OF TELEGRAPHIC COMMUNICATION WITH STATIONS ON THE WEST COAST OF CENTRAL AND SOUTH AMERICA.

The lines and cables of the Central and South American Telegraph Co. are now in working order, although not yet ready for the acceptance of public business, and the announcement that messages may be taken for transmission may be expected on or before September 1, 1882. Notice of the day upon which messages may be accepted for transmission will be given hereafter by special order.

The rules for the acceptance and treatment of messages to and from the Central and South American Co., are the same as those which govern messages to and from the Atlantic cables.

THE FOLLOWING ARE THE RATES PER WORD:

From all W. Union offices in the United States, (except those in Texas and Louisiana), to

MEXICO.

Goatzacoalcos, 62 cents. Salina Cruz, 72 cents.

CENTRAL AMERICA.

SALVADOR.

La Libertad, 75 cents.

To other places in Salvador, named below, charge 5 cents per word in addition to the rate to La Libertad:

Armenia, Almendros, Acajutla, Ahuachapan, Atiquisaya, Comasagua, Cojutepeque, Chinameca, Chalchuapa, Cutala, Chalatenango, Coatepeque, Goteras, Guayabal, Jucuapa, Jocoro, La Union, Lempa, Metapam, Nejapa, Olocuilta, Opico, Quezaltepeque, Izalco, Robasco, Juayua, Sonsonate, Santa Ana, San Salvador, San Martin, Santa Tecla, Santa Rosa, San Miguel, San Vicente, Sensuntepeque, Sauce, San Andres, Suchitoto, Texis, Tonacatepeque, Usulutan, Umana, Zacatecoluca, Zaragoza.

GUATEMALA.

To places in Guatemala, named below, charge 5 cents per word in addition to the rate to La Libertad:

Aduana (capital), Antigua, Amititlan, Asuncion Mita, Chiquimulilla, Chiquimula, Chimaltenango, Coban, Cuilco, Chajinquilapa, Chichicatenango, Cuyotenango, Champerico, Coatepec, Chiantla, Chingo, Chinautla, Escuintla Encuentros, Esquipulas, Guatemala, Gualan, Huehuetenango, Izabal, Jasapa, Jalpatagua, Jutiapa, Las Marias, Mazatenango, Malacatan, Mataquescuintla, Nenton, Naranjo, Ostuncalco, Palin, Palacio (capital,) Petapa, Patzum, Patulul, Quiche, Quezaltenango, Retalhuleu, Rodeo, San Rafael, San Felipe, San Andres, Osuna, Santa Rosa, Santa Catarina, San Jose, San Agustin, Santo Domingo (capital) Santa Lucia, Solola, Sija, San Cristobal, San Pablo, San Marcos, San Pedro Pinula, Salama, Sacapulas, Tecpan, Tejutla, Tacana, Toconicapan, Villa Nueva, Zacapa, Zapotitlan.

HONDURAS.

To places in Honduras, named below charge 5 cents per word in addition to the word rate to La Libertad:

Amapala, Comayagua, Cedros, Campamento, Cantarranas Choluteca, Danli, El Corpus, El Rosario, Gracias, Guinope, Intibuca, Juticalpa, Jocomico, Lucerna, La Paz, La Brea, Naranjito, Nacaome, Omoa, Ocotepeque, Olanchito, Puerto Cortez, Protecion, Potrerillo, Pespire, Santa Barbara, Santa Rosa San Pedro Sula, San Juan de Flores, San Jose, San Antonio Del Norte, San Antonio de Oriente, San Diego, Sabana Grande, Saco, San Miguel Guancapla, Sulaco, Sonsaguera, Santa Maria, Talpetate, Tegucigalpa, Trujillo, Valle de Angeles, Yoro, Yuscaran.

NICARAGUA.

San Juan del Sur, $1.00

To other places in Nicaragua, named below, charge 5 cents per word in addition to the rate to San Juan del Sur:

Acoyapa, Chichigalpa, Chinandega, Corinto, Esteli, Granada, Jinotega, Jinotepe, Juigalpa, La Libertad, Leon, Managua, Matagalpa, Massaya, Metapa, Nagarote, Nandaime, Ocotal, Rivas, Somotillo.

COSTA RICA.

To places in Costa Rica, named below, charge 5 cents per word in addition to the rate to San Juan del Sur.

Alajuela, Atenas, Bagaces, Cartago, Esparta, Grecia, Heredia, La Guardia, La Palma, Liberia, Puntarenas, Santa Cruz, San Jose, San Mateo, San Ramon, Taboga, Tempisque, Tres Rios.

SOUTH AMERICA.

NOTE.—Messages intended for transmission via this route to South American stations should be marked, in the check, "*via Galveston.*" When no route is given messages will be forwarded as heretofore.

Panama,	$1.37	Aspinwall, Colon,	$1.42

U. S. COLOMBIA.

Buenaventura,	1.52

Bogota and other telegraph stations, 5 cents per word in addition to the rate to Buenaventura.

ECUADOR.

St. Elena Bay,	1.77	Guayaquil,	1.77

PERU.

Arica,	2.52	Mollendo,	2.47
Arequipa,	2.69	Pabellon de Pica,	2.68
Callao,	2.17	Payta,	1.92
Huanillos	2.68	Pisaqua,	2.68
Iquique,	2.57	Tacna,	2.68
Lima,	2.17		

BOLIVIA.

Antofogasta,	2.72		

CHILI.

Caldera,	2.82	Huasco	2.98
Carrizal,	3.03	Lota,	3.18
Chillan,	3.18	Ovalle,	3.03
Chanaral,	2.93	Santiago,	3.18
Cobija,	2.83	Serena,	2.92
Concepcion,	3.18	Talca,	3.18
Copiapo,	2.93	Taltal,	2.93
Coquimbo,	3.03	Talcahuano,	3.18
Famaya,	3.03	Tocopilla,	2.83
Freirina,	3.03	Valdivia,	3.18
Guayacan,	3.03	Vallenar,	3.07
Hiquera,	3.03	Valparaiso,	3.03

From W. Union offices in Louisiana and Texas, to all Central and South American Telegraph Co's stations, 6 cents per word less than the rates given above.

From New Brunswick, Nova Scotia, Ontario, Quebec, Manitoba and British Columbia, 3 cents per word more than from offices north of Louisiana and Texas.

ATLANTIC CABLE.

Communication through the Shanghai and Amoy and the Amoy and Hong Kong cables is interrupted. Messages for Amoy will be sent via best means.

The cable between Rio Grande and Montevideo has been repaired.

Messages for Egypt, except to Khedive Government, must be written in plain language. In Khedive Government messages secret language is allowed.

NEW OFFICES.

The following is a complete list, by States, of the names of offices not to be found in the new tariff book. Under the heading for each State, Territory or Province are printed, first the names of Western Union Offices in three columns, and second the names of "other" line and double star stations in single columns.

Managers will make no effort to enter the names of these new offices in their tariff books, but will take special care to preserve this JOURNAL and keep it where the list of new offices can be referred to by receivers.

All the places named in this list will be given in the next number of the JOURNAL, together with the names of offices opened between this and the date of that issue.

Messages to telephone offices will be accepted only at sender's risk. This applies to the telephone offices named in Tariff Book as well as to those named below.

ALABAMA.

313 Akron
285 Bangor.
294 Briarfield.
294 Calera.
323 Cuba.
323 Epes.
293 Falkville.
267 Notasulga.
324 Prichards.
266 Stock Mill.

* Alexander City, 40 3 (25 1 N. M. rate) Opelika.
* Dadeville 40 3 (25 1 N.M. rate) Opelika.
* Ft. Morgan, 75 5 Mobile.
* Gainesville, 25 2 Epes.
* Goodwater, 40 3 (25 2 N. M. rate) Opelika.
* Point Clear. 50 3 Mobile.
* Round Mountain, free telephone, Collinsville.

ARIZONA.

646 Adonde.
639 Bowie Station.
660 Canon Diablo.
641 Contention.
640 Dragoon Summit.
660 Flagstaff.
644 Gila Bend.
659 Holbrook.
642 Picacho.
645 Sentinel.
645 Texas Hill.
659 Winslow.

* Butte City, 50 4 Casa Grande.
* Pinal, 50 4 (30 2 N. M. rate) Casa Grande.
* Silver King 50 4 (30 2 N. M. rate) Casa Grande.

ARKANSAS.

449 Brentwood.
371 Gainesville.
371 Knobel.
391 Jacksonport.
371 Nettleton.
381 Palestine.
371 Parmley.
401 Russell.
449 West Fork.
449 Winslow.

* Warren 50 4 Pine Bluff.

BRITISH COLUMBIA.

* Bentons, 50 3 Sumas.

CALIFORNIA.

800 Alemada Point. Ck. Alemada.
827 Albion Mills.
791 Coopers Switch.
800 Decoto.
800 Ocean View.
720 San Gorgonio.
799 Norman Station.
826 Table Bluff.
713 Volcano Springs.
827 Whitesboro.

* Bidwell's Bridge, 25 2 by telephone, Greenville.
* Fall Brook, 40 3 San Diego.
* Lafayette, 15 2 by telephone, Martines.
* Leesville, 50 3 Colusa.
* Magalia, free, telephone, Oroville.
* National City, 25 2 San Diego.
* Walnut Creek, 15 2 by telephone, Martines.

COLORADO.

646 Agate.
546 Bennett.
565 Boreas.
623 Browns Canon.
540 Buffalo, Weld Co.
623 Calumet.
552 Carr.
540 Crook.
545 Deuel,
559 Earle.
541 First View.
545 Hardin.
590 Holleys.
599 Hortense.
623 Hot Springs.
634 Ignacio.
540 Iliff.
628 Kezar.
552 La Salle.
558 Oak Creek.
545 Orchard.
557 Pine Grove.
550 Pinon.
557 Red Cliff.
634 Rockwood.
628 Sargents.
536 Sedgwick.
545 Snyder.
558 South Pueblo. Ck. Pueblo.
552 Stout.
599 Tennessee.
592 Timpas.
599 Twin Lakes.
599 Woodstock.
559 Wootton, Ck. Morley.

* Akron, (N. M.) 65 4 Plattsmouth.
* Alens 25 1 Gunnison.
* Ashcroft (N. M.) 75 5 Gunnison.
* Aspen (N. M.) 85 6 Gunnison.
* Blair, (N. M.) 75 5 Plattsmouth, Neb.
* Bonanza (N. M.) 25 2 Villa Grove.
* * Conejos, 25 0 Antonito.
* Eckley (N. M.) 60 4 Plattsmouth, Neb.
* Elbert, (N.M.) 40 3 Denver.
* Elizabeth, (N.M.) 25 2 Denver.
* Empire, 25 2 telephone, Georgetown.
* Franceville, (N.M.) 40 3 Denver.
* Hyde, (N. M.) 60 4 Plattsmouth, Neb.
* McConnellsville, (N.M.) 40 3 Denver.
* Manitou Junc., (N.M.) 40 3 Denver.
* Parkers, (N.M.) 25 2 Denver.
* Platte Summit, 75 5 Plattsmouth, Neb.
* Querida, 40 3 telephone, Silver Cliff.
* Rock Springs (N. M.) 65 4 Plattsmouth, Neb.
* Saguache 25 2 (25 1 N. M.) Villa Grove.
* Wray (N. M.) 65 4 Plattsmouth. Neb.

CONNECTICUT.

25 Goshen, W'dham Co.
25 Hop River.
25 No. Windham.
37 Sandy Hook.
37 Southford.
37 Southbury.
29 South Lyme.
37 Stepney.
25 Thompson.

* Bridgewater, 20 0 by telephone, New Milford.
* Naubuc, 30 3 Hartford.
* Noroton, 10 0 by telephone, Stamford.
* Sherman, 20 0 telephone, New Milford.
* Warren, 20 0 by telephone, New Milford.
* * Whitneyville, 50 0 New Haven.
* Winnipauk, 10 0 by telephone, Norwalk.

DAKOTA.

947 Antelope.
886 Big Stone City.
940 Canning.
915 Chamberlain.
909 Clark Centre.
913 Cleveland.
947 Dickinson.
983 Eagles Nest.
913 Eldridge.
908 Ellendale.
890 Gardner.
947 Green River.
909 Henry.
890 Hillsboro.
926 Hitchcock.
947 Houston.
896 Kindred.
947 Little Missouri.
895 Mayville.
926 Miller.
898 Montrose.
915 Mt. Vernon.
920 Northville.
915 Ordway.
908 Preston.
926 Pukwana.
930 Rex.
924 Steele Sta.
924 Stering.
933 Sweetbriar.
930 Wessington.
926 Yorktown.

* Crook City, 50 2 by telephone, Deadwood.
* Colman, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Dell Rapids, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Egan, 55 4 La Crosse, Wis., or 25 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Fort Sisseton, 25 1 Webster.
* Grandin Farm, free, telephone, Hillsboro.
* Howard, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Madison, 55 4 La Crosse, Wis., 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.
* Pine Ridge Agency, 150 9 Cheyenne, Wy.
* Poplar River, 25 1 Bismarck.
* Rosebud Agency, 175 10 Cheyenne, Wy.
* Spear Fish, 50 2 by telephone, Deadwood.
* Sturgis City, 50 2 by telephone, Deadwood.
* Wentworth, 55 4 La Crosse, Wis., or 30 2 Sioux Falls, Dak., or 50 3 Ramsey, Minn.

DELAWARE.

67 Bear.
60 Broad Creek, summer office.
67 Hartley.
67 Kiamensi.
67 Porters.
60 Ross, Summer office.
60 Woodside.

FLORIDA.

* Blackwater, 50 5 Pensacola.
* Blue Pond, 75 5, (50 3 N. M. rate) Lake City
* Hawthorn, 75 5, (50 3 N. M. rate) Lake City.
* Highland, 50 4 Lake City.
* Kissimee (N. M.) 150 10 Lake City.
* Micanopy 75 5 (50 3 N.M. rate) Lake City.
* Orange Lake 75 5 (50 3 N.M. rate) Lake City.
* Paola, (N. M.) 100 6 Lake City.
* Perry Junction, 75 5, (50 3 N. M. rate) Lake City.
* Tocoi, (N. M.) 50 3, Lake City.
* Waits Crossing, 75 5, (50 3 N. M. rate) Lake City.

GEORGIA.

197 Chauncy.
207 Dubois.
246 East Point.
187 Folkston.
176 Johnston.
226 Lawrenceville,
186 Midville;
186 Perkins Junc.
246 Roswell.
197 Surrency.
226 Suwanee.
187 Victoria Mills.

* Abbeville (N. M.) 40 3 Ft. Gaines.
* Arlington, 40 3 Ft. Gaines.
* Blakely, 40 3 Ft. Gaines.
* Cedartown, 30 2 Cartersville.
* Rockmart (N. M.) 25 2 Cartersville.
* Senoia, (N. M.), 25 2 Newnan.

IDAHO.

578 Arimo.
970 Clark's Fork.
970 Dry Lake.
970 Hope Station.
970 Rathdrum.
970 Sand Point

ILLINOIS.

316 Algonquin.
300 Allendale.
307 Alpine.
336 Annawan.
299 Barton.
328 Beecher City, Effingham Co.
329 Belknap.
298 Bonfield.
336 Bureau, Ck. Princeton.
306 Cissna Park.
347 Clver Ck. Cuba.
308 Claytonville.
336 County Line Ck. Kewaunee.
336 Duggan, Ck. Kewaunee.
368 Epperson, Ck. Bushnell.
307 Dumser.
346 Forreston Junc.
318 Gays.
308 Goodwine.
317 Gravel Bank.
318 Hazel Dell.
308 Henderson.
317 Hills Park.
299 Indian Ia.
357 Knox Ck. Galva.
357 Larchland.
327 Lodge.
308 Lyford.
307 Mannheim.
309 Monrose, Effingham Co.
306 Nachusa.
307 New Lebanon.
307 North Evanston.
347 Oakford.
329 Olmstead.
358 Palmyra.
309 Palestine.
319 Parrish.
319 Rinard.
316 Richmond.
309 Rose Hill, Jasper Co.
309 St Marie.
309 Sidell.
297 State Line, Lake Co.
318 Stockton.
346 Union Grove.
348 Wann.
309 Wayne.
309 West Liberty.
318 Westfield.
299 Wetzel.
309 Wheeler.
358 Wrights, Ck. Greenfield.
337 Zanesville.

* Albion, 25 2 Huntingburg, Ind.
* Ausonia 25 2 Streator.
* Belmont, 25 2 Huntingburg, Ind.
* Big Rock 25 2 Aurora or Forreston.
* Kernan 25 2 Streator.
* Keenes 25 2 Huntingburg, Ind.

INDIANA

252 Briant.
271 Buena Vista.
298 Cedar Lake, Summer office.
231 Centerton.
300 Cynthiana.
252 Daleville.
280 English Lake.
299 Fountain, Vigo Co.
270 Grangers.
300 Ingles.
358 Letts Corner.
298 Lowell, Lake Co.
241 Maples.
262 Maxwell.
262 Milroy.
280 Monon.
300 New Harmony.
300 Owensville.
281 New Ross.
261 Ossian.
290 Paxton.
298 Rose Lawn.
253 Sandinia Crossing.
271 Sedalia.
271 Sycamore.
300 Wadesville.
258 Westport.
262 Warrington.

* Birdseye, 25 2 Huntingburg.
* Boston 25 2 Huntingburg.
* Burnville, 15 1, telephone Columbus.
* Clifford, 15 1, telephone Columbus.
* Crandall, 25 2 Huntingburg.
* * Ferdinand. By mail. Ferdinand Station.
* Hartford, Crawford Co., 25 2 Huntingburg.
* Illiana, free. by telephone, Dana.
* Lowell, Bartholomew Co. 15 1, telephone Columbus.
* Milltown, 25 2 Huntingburg,
* Oakland City, 25 2 Huntingburg.
* St. Louis Crossing 15 1, telephone Columbus.
* * St. Meinrad. By mail. Ferdinand station.
* Wayne City, 25 2 Huntingburg.
* Winslow, 25 2 Huntingburg.

IOWA.

463 Alton.
426 Angus.
887 Ashton.
425 Bale.
425 Bancroft.
417 Bethany Junc., Ck. Lamoni.
425 Bradgate.
346 Browns. Ck. Preston.
367 Buffalo.
425 Burt.
388 Charlestown.
426 Clive.
426 Cooper.
425 Dakota City.
367 Donahue, Ck. Dixon.
876 Estherville,
417 Exline.
367 Fairport.
435 Farnhamville.
454 Fletcher.
416 Galt.
407 Girard.
454 Gray.
425 Hardy.
416 Harcourt.
444 Havelock.
456 Henderson, Ck. Hastings.
426 Herndon.
426 Irvington.
386 Jackson Junc., Ck. Wanooma.
416 Kamrar.
454 Irwin,
435 Kalo.
445 Kirkman.
388 La Crew.
435 Lake City.
407 Laurel.
444 Laurens.
397 Libertyville.
435 Lohrville.
387 Long Point.
444 Marathon.
367 Montpelier.
455 North Boro.
417 Numa.
455 Page Centre, Ck. Clarinda.
444 Peterson.
416 Pilot Mound.
417 Polo.
463 Remsen.
416 Renwick.
846 Riggs, Ck. Preston.
426 Rodens.
426 Rutland.
473 Salix.
367 Sand Spring, Ck. Anamosa.
397 Selma.
444 Sioux Rapids.
455 Solomon.
876 Spirit Lake.
455 Stennett, Ck. Red Oak.
416 Thor.
416 Thrall.
407 Van Cleve.
417 Van Wert.
367 Viola, Ck. Stone City.
396 Wellsburg.
426 West Bend.
426 Yale.

KANSAS.

517 Alum Creek.
456 Argentine.
465 Baker.
456 Barclay.
457 Bronson.
521 Chase.
527 Cleveland.
517 Clifton.
527 Collyer.
503 Crawford.
527 Edmond.
456 Everest.
514 Galva.
507 Hazelton.
503 Horton.
456 Huron.
457 La Harpe.
465 Lancaster.
475 Larken.
527 Lenora.
507 Leonard.
507 Miltonvale.
457 Moran.
448 MulberryGrove.
456 North Lawrence Ck. Lawrence.
475 North Topeka, Ck. Topeka.
476 Piqua.
503 Strong City.
476 Toronto.
457 Uniontown.
518 Valley Center.
475 Wakarusa.
447 Waseca Junc.
466 Westphalia.
465 Willis
476 Yates Center.

* * Cottonwood Falls, 50 0 Strong City.
* Enterprise, 15 0, by telephone, Detroit.

KENTUCKY.

263 Bloomfield.
291 Central City.
263 Crescent Hill.
243 Donerail.
233 Earlinger.
263 Finchville.
253 Glencoe.
243 Pine Hill.
283 Rocky Hill.
263 SouthLouisville.
263 Taylorsville.
339 Wickliffe.

* Clay Lick, 25 1 by telephone, Worthville.
* Coombs Ferry, 25 2 Lexington, Ky., or 45 3 Huntington, W. Va.
* Eastern Junc., 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
* East Ky. Junc., 35 2 Huntington, W. Va.
* Flemingsburg, 15 2 by telephone, Johnson Junc.
* Gistville, 25 1 by telephone, Worthville.
* Gratz, 25 1 by telephone, Worthville.
* Kilgores, 30 2 Huntington, W. Va.
* Lockport, 25 1 by telephone, Worthville.
* Marion, 15 1 by telephone, Worthville.
* Mt. Savage, 50 3 Lexington, Ky., or 35 2 Huntington, W. Va.
* Olympia, 35 2 Lexington, Ky., or 50 3 Huntington, W. Va.
* Peach Orchard, 25 2 Catlettsburg.
* Pine Grove, 50 3 Huntington, W. Va.
* Port Riffle, 25 1 by telephone, Worthville.
* Rush, 50 3 Lexington Ky., or 30 2 Huntington, W. Va.
* Rockville 25 2 Catlettsburg.
* Springport, 20 1 by telephone, Worthville.

LOUISIANA.

404 Atchafalaya.
395 Baton Rouge Junc.
424 Boyce.
433 Derbonne.
424 Hope.
424 Garland.
442 Gloster.
375 Gouldsboro.
442 Grand Cane.
395 Grosse Tete.
354 Lookout.
424 Lecompte.
395 Maringuin.
434 Mermentau.
433 Moreland.
395 Plaquemine.
442 Pleasant Hill.
433 Provencal.
433 Prudhomme.
433 Robeline,
442 San Patrice.
433 Sinnott.
442 Stonewall.
395 Vacherie.
395 W. Baton Rouge.
424 Whitesville.

* Fodoche, 50 3 (30 2 N. M. rate), New Orleans.
* Millikens Bend (N.M.) 40 3 Tallulah.
* St. James, 50 3 (30 2 N. M. rate), New Orleans.

MAINE.

4 Presque Isle.
16 Lake Maranacook Ck. Livermore Falls.

* La Grange, 25 2 Bangor.
* * Kennebunkport 15 0 stage, Kennebunk.
* Poland Spring, Summer Office. 20 1 Lewiston.
* * Ocean Bluffs 5 0 stage, Kennebunk.
* Red Beach 15 1 telephone Calais.
* Robbinston, 20 1 telephone Calais,
* Sebec, 25 2 Bangor.
* So. La Grange 25 2 Bangor.

MANITOBA.

Alexandria.
Austin.
Brandon.
Burnside.
Chatter.
Dewinton.
End of Track.
Fourth Siding.
Flat Creek.
Gladstone.
McGregor.
Minnedosa.
Nepawa.
Portage La Prairie 8ta.
Rapid City.
Reaburn.
Rosser.
Sewell.
St. Boniface June
Sidney.
Third Siding.
Westbourne.
West Lynne.

The above named offices in Manitoba (except Portage La Prairie, Reaburn, Rosser, St. Bonnitace Junc. and West Lynne) should be checked direct at the rate of 25 and 2 more than the Manitoba State rate.

MARYLAND.

85 Ashland.
67 Black, summer office.
77 Bowie.
67 Centreville.
67 Churchville.
67 Edgewood
60 Fruitland.
85 Lutherville.
77 Marlboro.
67 Millington.
67 Octoroora Ck. Rowlandsville.
85 Odenton.
54 Peninsular Junc.
54 Pocomoke Station Ck. Pokomoke City,
67 Prices.
67 Sudlersville.

* Gaithersburg, 25 2 Baltimore.
* Hyattsville, 25 2 Baltimore, Md., or Washington, D. C.

Charge for three extra words in messages to Gaithersburg and Hyattsville, and accept only *prepaid day* messages.

MASSACHUSETTS.

36 Conway.
23 New Salem.
25 Oxford.
21 Wellesley Hills.
12 W. Harwich, Ck.
21 Tyngsboro.
25 W. Medway.

Dennisport.

* * Asylum Sta., 75 0 Danvers.
* Bass River Harbor, free by telephone, So. Dennis.
* * Burlington 150 0 Woburn.
* Cochesett, 25 0 by telephone, East Bridgewater.
* Collins' Mills, Dracut, 15 1 by telephone, Lowell.
* * Cummingsville, 50 0 Woburn.
* * Danvers Centre, 25 0 Danvers.
* Danvers Insane Hospital, free by telephone, Salem
* * Danversport, 25 0 Danvers.
* Dracut Navy Yard, 15 1 by telephone, Lowell.
* Forge Village, 15 1 by telephone, Lowell.
* * Gardner, 15 0 Gardner Depot.
* Graniteville, 15 1 by telephone, Lowell.
* * Holbrook, free, Braintree.
* Hyannisport, 15 0 by telephone Hyannis.
* * Longmeadow 150 0 E. Longmeadow.
* Lunenburg, 10 0 by telephone, Fitchburg.
* * Mattield, 50 0 East Bridgewater.
* * Melrose Highlands, 25 0 Melrose.
* Middlesex Village, 15 1 by telephone, Lowell.
* * No. Middleboro, 150 0 Middleboro.
* * No. Woburn 75 0 Woburn.
* Phenix Village, Tewksbury, 15 1 by telephone, Lowell.
* Point of Pines Revere Beach 25 0 telephone, Chelsea.
* * Rock, 150 0 Middleboro.
* South Billerica, 15 1 by telephone, Lowell.
* So. Gardner, 15 0 Gardner Depot.
* South Mills, 10 0 by telephone, New Bedford.
* Weentham, 35 0 by telephone, Providence, R. I.
* West Bridgewater, 15 0 by telephone, East Bridgewater.
* W. Chelmsford, 15 1 by telephone, Lowell.
* * W. Danvers, 150 0 Danvers.
* * Westford, 25 0, Westford Depot.
* Westford Depot, 15 1 by telephone, Lowell.
* * West Gardner, 15 0 Gardner Depot.
* * Woburn Highlands, 25 0 Woburn.

MEXICO.

* Gallego, 58 6 El Paso, Tex.
* La Jarita, 25 2 Laredo, Texas.
* Laguna, 66 7 El Paso, Tex.
* Montezuma, 52 5 El Paso, Tex.
* Paso del Norte, 25 2 El Paso, Tex.
* Parral de Hidalgo, 450 43 Brownsville, Tex.
* Rodriques, 25 2 Laredo, Texas.
* Samalayuca, 40 4 El Paso, Tex.
* San Jose, 43 4 El Paso, Tex.

MICHIGAN.

127 Alanson.
127 bay View.
138 Beaver Lake.
220 Beech.
269 Bowens.
231 Bridg water.
211 Britton.
210 Brockway Centre
210 Brown City.
240 Collins.
250 Crapo
836 Crystal Falls (*north*).
269 Diamond Lake Ck. White Cloud.
210 Fostoria.
127 Freedom.
119 Free Soil.
230 Garfield.
137 Hobart.
127 Indian River.
231 Jerome.
230 Kawkawlin.
119 Manistee Junc.
210 Marietta.
137 Milton Junc.
210 Mayville.
260 Moline.
127 Mullet Lake.
833 Narenta. (*North.*)
231 North Fayette.
231 North Morenci.
250 Orleans.
270 Penn.
833 Powers (*north*) Ck. Spalding.
260 Ransom.
200 Sanborne.
260 Shelbyville.
220 Swartz Creek.
127 Topinabee.
127 Vanderbilt.
269 Walkup Ck. White Cloud.
100 Wetzell,
127 Wolverine.

* Au Train, 40 3 Marquette.
* Flushing, 15 0 by telephone, Flint.
* Lee ville 15 0 telephone, Detroit.
* Munising, 40 3 (30 2 N rate,) Marquette.
* Newberry, 40 3 (30 2 N. M. rate) Marquette.
* Palms, 4 3 (30 2 N. M. rate) Marquette.
* Roseville 15 0 telephone. Detroit.
* St Ignace, 40 3 (30 2 N. M. rate) Marquette.
* Sand River, 40 3 Marquette.
* Seney, 40 3 (30 2 N. M. rate) Marquette.

MINNESOTA.

190 Argyle.
865 Arlington.
885 Ba tle Lake.
875 Buffalo Lake.
885 Clitheral.
865 Cologne.
874 Deer Creek.
880 Garfield.
865 Gaylord.
870 Green Isle.
874 Heming.
883 Humboldt.
889 Kennedy.
884 Kitson.
865 Lake Park Hotel, Lake Minnetonka
861 Lakeland.
861 Minnehaha.
865 Minnetonka Beach.
890 Muskoda.
883 Northcote,
865 Northome, Summer Office.
870 Oshawa.
885 Paradale.
875 Vernon Centre.
865 Waconia.
865 Winthrop.

* Currie, 25 2 Tracy.
* Deforest, 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis, or 35 2, Sioux Falls, Dak.
* Prairie Junc., 40 3 Ramsey, Minn., or 50 3 La Crosse, Wis., or 35 2 Sioux Falls, Dak.

MISSISSIPPI.

363 Armistead.
863 Morton,

* Arcola, 85 6 Vicksburg
* Johnsonville, 85 6 Vicksburg.
* Overley, 85 6 Vicksburg.
* Shipland 50 3 Vicksburg.
* Stoneville, 85 6 Vicksburg.

MISSOURI.

399 Aurora, Miller Co.
446 Calla.
398 Clark.
369 Creve Coeur Lake
457 Ellis.
369 Elah.
418 Fountain Grove.
370 Gads Hill.
427 Gault.
369 Gilmore.
360 Grays Ridge.
388 Granger.
370 Hogan.
388 Knox.
369 La lede, St. Louis Co.
437 Lake City.
349 Lakeville.
398 McMullin.
370 Middlebrook.
359 Montesano Spgs.
426 Montserrat.
437 Napoleon.
369 Richfield, Ck. Old Monroe.
399 Russellville.
427 Sampsel.
398 Shelbyville. Ck. Shelbina
359 Vineland.

* Ashley, 10 0, by telephone, Bowling Green.
* * Augusta. By mail, Labadie.
* * Greenfield, 50 0 So. Greenfield.
* Lemons 25 2, Unionville.
* Pardin, 25 2 Unionville.

MONTANA.

957 Ainslie.
957 Big Horn.
970 Cabinet
958 Forsythe.
960 Huntley.
956 Keith.
958 Martin.
959 Myers.
583 Melrose.
957 Milton.
960 Pompeys Pillar.
583 Silver Bow Junc.
957 Terry.

* Billings, 25 1 Helena, Mon. or 50 2 Bismarck, Dak.
* Ft. Maginniss 50 2 Biamarck, Dakota.
* Rocky Point 25 1 Bismarck, Dakota.
* Mardenville, mail Ft. Maginniss.
* Walkerville, 30 2 telephone Butte City.

NEBRASKA.

474 Adams.
927 Ainsworth.
947 Atkinson.
474 Avoca.
474 Brock.
538 Chappell.
922 Clear Water.
464 Gilmore.
464 House.
474 Howe.
927 Inman.
22 Long Pine.
974 Sheridan.
464 Springfield
465 Stella.
474 Talmage.
927 Stuart.
465 Verdon.
473 Wakefield.
473 Wayne.
474 Weeping Water.

* Auburn (N. M.) 25 2 Nemaha City.
* Benkleman, (N. M). 60 4 Plattsmouth.
* Burchard. (N. M.) 35 2 Plattsmouth.
* Haigler, (N. M.), 60 4, Plattsmouth.
* Liberty, (N. M.), 35 2 Plattsmouth.
* McCook (N. M.) 55 4 Plattsmouth.
* Putnam (N. M.) 35 2 Plattsmouth.
* Stratton, (N. M.), 55 4 Plattsmouth.

NEVADA.

677 Junction.
676 Luning.
677 Rhodes.
676 Soda Springs.

NEW BRUNSWICK.

3 Albert.
3 Carleton Sta.
3 Lake Ha Ha.
3 St. Louis.

* Port Elgin, 25 2, Sackville.

NEW HAMPSHIRE.

20 Intervale, summer office.
31 E. Lebanon.
20 Livermore.

* Chesterfield, 25 0 by telephone, Brattleboro, Vt.
* Chesterfield Lake, 25 0 by telephone, Brattleboro, Vt.
* Concord State Prison, 10 0 by telephone, Concord.
* North Hinsdale, 20 0 by telephone, Brattleboro, Vt.
* W. Concord, 15 1 telephone, Concord.

NEW JERSEY.

47 Bay Head.
52 Blairstown.
41 Brick Church. Tariff same as Orange.
53 Cedar Brook.
47 Centreville, Passaic Co.
47 Chadwicks.
47 Clementon.
52 Finderne, Ck. Somerville.
41 Franklin (Essex Mills).
47 Forked River Sta
53 Franklinville, Summer office
47 Hartford.
41 Hewitts.
41 Iselin.
47 Kingston, Ck. Trenton.
47 Magnolia.
59 Malaga, Summer office.
52 Nolans Point, Lake Hopatoong
41 Oradell.
52 Valley.
47 Waretown.
41 Wayne.
41 West Orange.
52 Vienna.

* Barnegat City 25 1 Philadelphia, Pa.
* Crosswicks 15 1 telephone, Trenton.
* Yardville 15 1 telephone, Trenton.

NEW MEXICO.

559 Blossburg.
566 Cerrillos.
637 Coolidge.
559 Dillon.
633 Florida.
828 Fort Selden, Ck. Las Cruces.
559 Lynn, Ck. Morley, Col.
632 Monero.
630 San Antonio.
638 Separ.
639 Stein's Pass.
636 Upham.

* Fort Stanton, 25 3 San Marcial.
* Fort Union, 25 2, Watrous.
* * Ojo Carliente, 50 0 Barranca.

NEW YORK.

64 Albion Station, Oswego Co. Ck. Sand Bank.
65 Apalachin.
33 Broad Channel, Rockaway Beach Summer-office, Ck. B Beach.
33 Brown's Sta. Yates Co. summer office.
111 Cuba.
139 Ch'tauqua, Summer Office.
101 Cohocton
46 Cornwall on Hudson.
33 E. Rockaway summer office.
74 Fish Creek,
51 Fish's Eddy, Delaware Co.
33 Great Neck, L. I.
33 Greenawn.
33 Glen Mountain House, Tariff same as Watkins, Ck. Watkins.
101 Halbert.
41 Hartsdale.
40 Hensonville.
58 Jeffersonville.
56 Keeneville.
101 Lakeville, Summer Office.
111 Little Genesee.
46 Livingston Manor.
33 Lowmanville.
64 Mannsville.
74 McConnellsville.
44 Millers Paranac Lake House.
46 Milton.
33 Nichols.
41 North Tarryto'n.
33 North Lansing.
51 Rockland.
33 Ronkonkoma.
73 Round Island Park, St. Lawrence River.
74 Scriba.
40 So. Cairo.
46 State Camp, Peakskill.
46 Sterlington.
37 Stormville.
41 Tarrytown Sta.
73 Thousand Island Park, Summer office.
44 Trembloys Iron Works.
65 Vestal.
46 Wallkill.
111 Westons, Cattaraugus Co.
37 West Patterson.
74 West Vienna.
111 White House.
46 Wicopee Junc.
111 Wigwam.

* Aliens Hill, 20 0 telephone, Canandaigua.
* Ava, 20 0 telephone, Rome.
* * Bath-on-the-Hudson, 25 0 Albany
* Bristol, 15 0 telephone, Canandaigua.
* Brushland, 25 2, Delhi.
* Delta, 10 0 telephone, Rome.
* * Four Corners S. I., 30 0 W. New Brighton.
* Ghent 15 1 telephone, Chatham.
* Honeoye, 25 0 telephone, Canandaigua
* * Kenwood, 25 0 Albany.
* Lee Centre, 10 0 telephone, Rome.
* * Linoleumville, S. I., 100 0 W. New Brighton.
* Minisink, Orange Co., 15 1 Port Jervis.
* Point Rock, 15 0 telephone, Rome.
* Stokes, 10 0 telephone Rome.
* Taberg, 15 0 telephone, Rome.
* Vernon, 10 0 by telephone, Oneida.
* W. Branch, 15 0 telephone, Rome.
* * Whitestown, 75 0 Utica.

NORTH CAROLINA.

206 Alexanders.
115 Chapel Hill.
125 Laurel Hill.
134 Jamestown.
173 Newton.
144 Rowan Mills.
194 Warm Springs.
98 Whiteville.

* Falkland, 25 2 (25 1 N. M. rate), Tarboro.
* Nags Head 25 1 Norfolk, Va.
* Pactolus, 40 3 (30 2 N. M. rate), Tarboro.

NOVA SCOTIA.

2 Albion Mines.
2 Sherbrooke.
2 White Haven

* Baddeck, 25 2 North Sydney.
* Ingonish, 25 2 North Sydney.
* Tusket, 15 1 telephone, Yarmouth.
* Tusket Ledge, 15 1 telephone, Yarmouth.

OHIO.

221 Alvada.
241 Alvordston.
170 Barton.
151 Brilliant.
222 Browns.
218 Buena Vista.
201 Clarksfield.
180 Creston
180 Dalton.
232 Enterprise.
180 Everett, Summit Co.
180 Fair Grounds.
222 Freeport, Warren Co.
180 Geauga Lake.
202 Hadley Junction
242 Hollandsburg,
170 Jewett.
191 Lakeville
242 Laura,
180 Lodi.
202 Longstreth
221 Luckey.
242 Ludlow Falls.
221 McComb.
221 McGuire.
232 Mercer.
222 Milledgeville.
180 New Berlin, Stark Co.
222 New Carlyle.
213 Newport.
159 North Benton.
242 Osgood Sta.
192 Point Pleasant, Gallia Co.
252 St. Johns.
180 Spencer, Medina Co.
212 Storms.
218 Wheelersburg.
180 West View.
232 Westville.
232 Yorkshire.

* Anderson station, 10 0 by telephone, Chillicothe.
* Andersonville, 10 0 by telephone, Chillicothe.
* Biers Run, 10 0 by telephone, Chillicothe.
* Brownstown, 10 0 by telephone, Chillicothe.
* Catawba Island, Ottawa Co. 25 2 Sandusky.
* Clarksburgh, 10 0 by telephone, Chillicothe.
* Danbyville, 10 0 by telephone, Circleville.
* De Kalb, 25 2 Mansfield.
* East Orwell, (N. M.) 25 2 Ashtabula.
* Five Points 10 0 by telephone, Circleville.
* Greenland, 10 0 by telephone, Chillicothe.
* Haysville, Pickaway Co., 10 0 by telephone, Circleville.
* Hartville, 15 1 Minerva.
* Haysville, Ashland Co., 15 1 by telephone, Ashland.
* Jeromeville, 15 1 by telephone, Ashland.
* Kinnickinnick, 10 0 by telephone, Chillicothe.
* Middle Branch, 15 1 minerva.
* Mogadore, 15 1 Minerva.
* Monitor 25 2 telephone, Ironton.
* Monroe Centre, 20 2 No. Kingsville.
* New Hazelton, 15 1 Minerva.
* New Richland 25 2 telephone, Ironton.
* No. Baltimore, 25 2 Defiance or Tiffin.
* Oakwood, 25 2 Fostoria, O., or Ft. Wayne, Ind.
* Osnaburg, 15 1 Minerva.
* Pierpont, 25 2 No. Kingsville.
* Poland, free by telephone, Youngstown.
* Racine 20 1 telephone, Pomeroy.
* Red Lion, 15 1 by telephone, Franklin.
* Rimer 25 2 Delphos.
* Robertsville, 15 1 Minerva.
* Rutland 20 1 telephone, Pomeroy.
* Sherrodsville, 15 1 Minerva.
* So. Elmwood, 10 0 by telephone, Circleville.
* Syracuse 20 1 telephone, Pomeroy.
* Texas Hollow 25 2 telephone, Ironton.
Vesuvius Sta. 25 2 telephone, Ironton.
* Yellow Bud, 10 0 by telephone, Chillicothe.

OREGON.

785 Bonneville.
804 Goshen.
803 Hillsboro.
795 Whites.

* Airlie (N. M.) 50 3 Portland.
* Blue Mountain, 50 5 by telephone, Walla Walla, W. T.
* Fort Klamath, 50 3 Ashland.

PENNSYLVANIA.

84 Antes Fort.
59 Ardmore.
140 Arthurs.
140 Bald Ridge.
159 Berwyn.
59 Brandywine Summit.
130 Clarendon Depot Tariff same as Warren.
140 Coaltown-
66 Conynghsm.
140 Corsica.
52 Cresco, Monroe Co.
58 Dunmore, Ck. Scranton.
59 East Greenville,
122 Elk Lick.
151 Etna, allegheny Co.
140 Evansburg, But-
94 Hunter's Run.
140 Jackson Centre.
93 Jackson Summit
93 Jackson Summit
131 June Bug.
93 Landrus.
76 Leaman Place.
94 Lewistown Junc.
59 Logan, Phila. Co. Ck. Wayne Junc.
140 Lucinda Station.
59 Lukens, Ck. Norristown.
140 Mainville.
130 Marienville.
84 Mainville.
93 Morris, Tioga Co.
84 Mountain Grove.
140 Neshannock Falls
59 Hahn's, Ok. Legeville.
66 Plymouth June, Ck. Plymouth,
84 Slippery Rock.
84 Snydertown.
140 Songbird
140 S. & A. Junction.
Ck. Mercer.
151 South Side, Pittsburg. Tariff same as Pittsburgh. Ck. Pittsburgh.
59 Stonerville.
140 Strattonville.
130 Thompsons, Warren Co.
66 Tripoli, Ck. Kempton.
111 Turtle Point.
150 Union City Depot
151 Van Port.
59 Virginsville, Ck. Moselem.

ler Co. 140 Rimersburg. 140 Volant.
151 Fallston. 76 Richland, Ok. 150 WaterfordDepot.
121 Fairmount City. Sheridan Leb-130 Warren Depot.
130 Farnsworth. anon Co. 59 Wayne, Delaware
130 Garfield. 58 Rowland's. Co.
59 Geigertown. 94 St. Thomas. 84 W. Milton Ck.
84 Georgetown. 111 Scahonda. Montgomery.
59 Gibralter, Ok. 59 Shelly Tariff 151 Wildwood.
Bi dsboro. same as Qua- 151 Wilkinsburg.
66 Girard Manor. kertown, Ok. 75 Williwanna.
Ok. Ringtown. Quakertown. 151 Willow Grove,
59 Glen Moore 130 Sheffield Depot. Allegheny Co.
59 Honey Brook. 47 Schencks, Ck. 140 Wilmington.
66 Hunlock's. Bristol. 140 Zelienople.

* Academy Corners, 10 1 by telephone, Lawrenceville.
* Alms House, 10 1 Allentown.
* Ballietsville, 10 1 Allentown.
* Best Sta, 10 1 Allentown.
* Centre Point, 10 1 Allentown.
* Centreville, Elk Co., free, by telephone, Scahonda.
* Churchville Berks Co., 10 1 Allentown.
* Clayton, 10 1 Allentown.
* Corning, 10 1 Allentown.
* Cowanesque Valley, 20 1 by telephone, Lawrenceville.
* Dillingersville, 10 1 Allentown.
* Elmer, 20 1 by telephone, Lawrenceville.
* Eagleville, 10 1 Allentown.
* Fairview, Montgomery Co , 10 1 Allentown.
* Fagleysville, 10 1 Allentown.
* Franklin, Lehigh Co. 10 1 Allentown.
* Gilbertsville, 10 1 Allentown.
* Harrison Valley, 20 1 by telephone, Lawrenceville.
* Harrison Valley Tannery, 20 1 by telephone, Lawrenceville.
* Ironton, 10 1 Allentown.
* LimerickSquare, 10 1 Allentown.
* Lower Milford, 10 1 Allentown.
* Neffs, 10 1 Allentown.
* Nelson, 10 1 by telephone, Lawrenceville,
* New Berlin, 10 1 Allentown.
* Overbrook, free by telephone, Merion Sta., Montg'y Co.
* Pleasant Corner, 10 1 Allentown.
* Red Hill, 10 1 Allentown.
* Ruchsville, 10 1 Allentown.
* Saegersville, 10 1 Allentown.
* Schnecksville, 10 1 Allentown.
* Slatedale, 10 1 Allentown.
* Trappe, 10 1 Allentown.
* * Unionville, Chester Co., 100 0 Kennett Square.
* * Wurtemburg, 25 0 Slippery Rock
* Yellow House, 10 1 Allentown.
* Zionsville Sta., 10 1 Allentown.

PRINCE EDWARD ISLAND.

* Bear River, 50 3 Sackville, N. B.
* Bedford 50 3 Sackville, N, B.
* Bloomfield, 50 3 Sackville, N. B.
* Bread a bom, 50 3 Sackville, N. B,
* County Line, 50 3 Sackville, N. B.
* Freetown, 50 3 Sackville, N. B.
* Monell, 50 3 Sackville, N. B.
* O'Leary, 50 3 Sackville, N. B.
* Port Hill sta., 50 3 Sackville, N. B.
* Wellington, 50 3 Sackville, N. B.
* York, 50 3 Sackville, N. B.

QUEBEC.

Beauce Junc. St. Alphonse de la Grande
Bulwer. Baie.
Eustis.

* Amherst Harbor, Magdalen Islands, 75 5 No. Sydney, N.S.
* Etang du Nord, Magualen Islands, 75 5 No. Sydney, N. S.
* Grosse Isle, Maydalen Islands, 75 5 North Sydney, N. S.
* House Harbor, Magdalen Islands, 75 5 No. Sydney, N. S.

RHODE ISLAND.

18 Riverside.

* Barrington, 25 0 by telephone, Providence.
* Caepatchet, 25 0 by telephone, Providence.
* Hamilton, 25 0 by telephone, Providence.
* Wrentham, 25 0 by telephone, Providence,

SOUTH CAROLINA.

163 Black's. 146 Ravenels. 174 Welford.
146 Jacksonboro. 165 Ridgeland.

TENNESSEE.

292 Bellevue. 292 Madison. 292 White Bluffs.
292 Bon Aqua Sp'gs. 265 Sunbright. 215 Whitesburg.
245 Coulterville. 183 Union Depot. 340 Withe.
245 Lansing. 292 Warner.

* Rhea Springs, Summer office, 25 2 Spring City.
* Somerville. 25 2 Moscow.
* Obion, 25 2, Rives.

TEXAS.

500 Abbott. 510 Farmersville. 830 San Elizario (*So.*)
652 Albany. 460 Forest. 657 Sierrablanca (*So.*)
650 Aledo. 672 Haskell, (*South*). 656 San Martin (*So.*)
651 Alexander. 648 Hodge. 674 Strowb'dge, (*So.*)
656 Antelope (*South.*) 489 Hungerford. 603 Temple Junc.
669 Atascosa (*South*) 654 Iatan (*South*). 490 Thorndale.
479 Bagwells. 603 Lorena. 603 Troy.
657 Boracho (*South*). 470 Lodi. 670 Twohig (*So*).
670 Catulla(*South*). 655 Metz (*South*). 657 Van Horn, (*South*
657 Cariso Pass (*So*). 673 Marfa (*South*). 470 Wayne.
470 Carrolls Praire. 603 Mountain Home 671 Webb (*South*).
485 Clear Creek. Bell Co 500 West.
495 Cuero (*South*). 669 Odessa (*South*). 657 Wildhorse(*South*
499 Davenport(*So.*) 656 Pearsall (*South*) 483 Winona.
494 Dupree. 655 Pyote (*South*) 489 Wharton
670 Encinal (*South*) 652 Putnam. 830 Ysleta (*So*
603 Eddy. 655 Sand Hills, (*So*).

* Aguilares, 50 3 Corpus Christi, or 30 2 Laredo.
* Aurora, 25 2 Ft. Worth.
* Benavides, 40 3 Corpus Christi, or Laredo.
* Bowie, 30 2 Fort Worth.
* D'hanis, 50 3 San Antonio,
* Eagle Pass Junction, 100 7 San Antonio.
* Henrietta, 25 1 Denison, Texas, or Dodge City, Ka. or 35 3 Ft. Worth.
* Hondo City, 50 3 San Antonio.
* * Kaufman, mail, Dallas.
* Kountz, 35 2 Beaumont.
* Lacoste, 40 3 San Antonio.
* Los Angeles, 50 3 Corpus Christi, or 30 2 Laredo
* Pena, 40 3 Corpus Christi, or Laredo.
* Realitos, 40 3 Corpus Christi,
* Sabinal, 7o 5 San Antonio.
* Salado, 40 3, Austin.
* San Diego, 40 3 Corpus Christi, or 50 3 Laredo.
* Sunset 30 2 Ft. Worth.
* Village, 40 2 Beaumont.

UTAH.

575 Hot Springs.

* No Ogden 30 2 by telephone, Ogden,
* Plain City, 50 3 by telephone, Ogden.

VERMONT.

38 Congress Hall Sheldon Summer office. 27 Passumpsic.
38 Maquam Bay. 31 Pompanoosuc.
47 Miles Pond. Ck. St. Johnsbury. 39 South Wallingford.

* East Arlington, 10 1 Arlington.
* E. Rupert, 15 2 Factory Point.
* Guilford, 10 0 by telephone, Brattleboro.
* Hartwellville, 20 1 by telephone, No. Adams, Mass.
* Jacksonville, 25 2 by telephone, No. Adams, Mass.
* North Stamford, 15 1 by telephone, No. Adams, Mass
* Readsboro, 20 1 by telephone, No. Adams, Mass.
* Readsboro Falls, 20 1 by telephone, No. Adams, Mass.
* Sadawga, 25 2 by telephone, No. Adams, Mass.
* Stamford, 15 1 by telephone, No. Adams, Mass.
* Wells, 15 2 Factory Point.
* West Arlington, 15 1 Arlington.
* West Dover, 25 0 by telephone, Brattleboro.
* Wilmington, 20 0 by telephone, Brattleboro.

VIRGINIA.

123 Afton. 114 Concord. 86 R. F. & P. Junc.
114 Appomattox. 123 Greenville. 133 Riverside.
153 Backbone. 123 Lyndhurst. 153 Roanoke.
96 Bon Air, Chesterfield Co. 123 Milnes. 153 Troutville.
162 NewRiver Depot. 123 Vesuvius.
133 Buffords. 133 Lithia. 113 White Post.
153 Clifton Forge. 96 Nottoway C. H. 96 Wilson's Depot
153 Cloverdale. 95 Plains.

* Henrico, 25 2 Richmond.
* Indian Rock (N. M.) 40 3 Richmond.
* Lairds, (N. M.), 40 3 Richmond.
* Lee Hall, 30 2 Richmond.
* New Market, Nelson Co., (N. M.) 25 2 Richmond.
* Salisbury, (N. M.), 40 3 Richmond.
* Wilton (N. M.) 50 3 Richmond.
* Yorktown, 45 3 Richmond.

WASHINGTON TERRITORY.

784 Carbonado. 727 Prescott. 722 So Texas.
978 Marshall 774 Skagit City. 738 Tuchet.

WEST VIRGINIA.

* Janelew,† 50 4 Wheeling or Parkersburg.
* Lost Creek,† 50 4 Wheeling or Parkersbur.
* Talcott, (N. M.) 25 2 Greenbrier, W. S. Spgs. or 50 3 Huntington.
* Weston,† 50 4 Wheeling or Parkersburg.
* Winifrede Junc., (N. M.) 30 2 Greenbrier, W. S. Spgs, or 45 3 Huntington.

† Charge for three extra words in messages to these offices; and accept only *prepaid day* messages.

WISCONSIN.

837 Abrams. 356 Livingston. 345 Sauk City.
340 Barneveld. 325 London. 306 Spring Meadow.
306 Calhoun. 325 Marshall. 837 Stiles.
325 Cottage Grove. 842 Meehan. 326 Sullivan.
847 Curtiss. 345 Merritts Land'g 854 Superior.
306 Douseman. 306 No. Greenfield. 852 Superior Junc.
340 Eden, Fond du Lac, Co. 839 Pelican Sta. 839 Summit Lake.
345 Prairie du Sac. 845 Twin Bluffs
839 Elmhurst, 345 Richland City, 850 Tunnel City.
852 Hayward. Ck. Lone Rock. 855 Turtle Lake.
325 Jefferson Junc. 847 Rudolph. 306 Wales.
339 Kempster.

* Bailey's Harbor 25 2 Horn's Pier.
* Big Suamico, 15 0 by telephone Green Bay.
* Cary, 25 2 Eau Claire.
* Downsville. 25 2 Eau Claire.
* Dunville, 25 2 Eau Claire.
* Durand, 25 2 Eau Claire.
* Jacksonport, 25 2 Horn's pier.
* Lawrence, 25 2 Eau Claire.
* Meridean, 25 2 Eau Claire.
* Portersville, 25 2 Eau Claire.
* Shawtown, 25 2 Eau Claire.
* Sturgeon Bay Canal, 25 2 Horns Pier.
* St. Josephs Pier, 25 2 Horns Pier.
* Whitefish Bay, Door Co., 25 2 Horn's Pier.

WYOMING

573 Fossil. Cokeville. 551 Harper.

NORVIN GREEN,
President.

TRANSFER SERVICE.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *August* 15, 1882.

To all Transfer Agents:

MR. J. B. TREE has been appointed Acting Transfer Agent of this Company at Richmond, Va.

NORVIN GREEN,
President.

DISCHARGE OF ELECTRICITY BY HEATED BODIES.

IT is stated, in *Engineering*, that a burning match or a gas flame acts as a discharge of electricity, this fact having been applied by Sir William Thomson to his portable electrometer in observing the potential of the atmosphere at any point Recent experiments by Professor Guthrie have shown that an incandescent platinum wire also acts as a discharge of electricity, displaying a preference for discharging a negative rather than a positive charge. If a platinum wire, made incandescent by an electric current, is placed between two gold-leaf electroscopes, one charged with positive and the other with negative electricity, it will be found that the negative charge is rapidly drawn off, while the positive charge remains almost unaffected. The wire in this experiment was at a dull red heat, and it is probable that a higher temperature would also have effected the discharge of the positive electricity. Professor Guthrie likewise shows that a red-hot metal ball at certain high temperatures will not accept a charge of positive or negative electricity from the conductors of a glass electrical machine, while at certain lower temperature it will accept a negative charge, but not a positive one, and at still lower temperature it will take both a positive and negative charge.

THERE is an impression abroad among electricians, both of the theoretical and the practical side of the house, that in the near future there is much more to be gained in turning to the best account past discoveries than in trying to make new ones. This is what *L'Electricite* has begun to say of those who would be their own biographers and take very good care not to underrate themselves: "Bell does not efface Reis; Faure cannot destroy Plante, and Swan, Edison, and the others cannot suppress the anterior labors of Chanzy."

EXPERIMENTS have been made with the electric lamp for locomotives on the system of Messrs. Sedlaczel and Wikulill, on the North France Railway. The lamp is placed in front of the engine, so as to light the permanent way. The experiments have shown that it burns steadily, even when the train goes at express speed; that the light does not interfere with the visibility or the distinctive color of the signals, and that neither the engine drivers nor officials of the train carrying the light, nor of other approaching trains, are dazzled by it. The drivers are able to see the line distinctly for a distance of 300 yards ahead.

IT is proposed to try a novel experiment at Paris by producing a series of scientific dramas at one of the theatres, with the object of combining amusement with instruction. Three plays have already been provided, and their titles clearly indicate the direction in which the audience is to be instructed. The titles are: "Denis Pepin, or the Invention of Steam;" "Kepler, or Astronomy and the Astrologer," and "Gutenberg, or the Invention of Printing." The result of this new dramatic venture will be awaited with interest. Its success may be the inauguration of a new era in science teaching.

IF you want to become a telegraph operator, send twenty-five cents to C. E. Jones & Bro., Cincinnati, Ohio, for the best illustrated instruction book.

(*Continued from page* 161.)

If, on the other hand, we have in the circuit a gaseous column, with the resistance R, we have

$$L\frac{di}{dt} = nE - nR - nri,$$

whence

$$i = \frac{E - R}{r}$$

The resistance R of the gaseous column is therefore in the numerator and not in the denominator, where it would stand according to Ohm's law. Hence we see that E must necessarily be greater than R if a current is to arise at all.

If in the case where the gaseous column is present in the circuit we introduce two different rheostatic resistances, we shall obtain, since i and i_1 denote the corresponding strengths of current,

$$i = \frac{E - R}{r} \text{ and } i_1 = \frac{E - R}{r_1}$$

If the gaseous column is thrown out of the circuit, and if M and M_1 are the resistances required to obtain again the strengths of current i and i_1, we have

$$i = \frac{E}{M} \text{ and } i_1 = \frac{E}{M_1}$$

whence

$$\frac{i_1}{i} = \frac{M - r}{M_1 - r_1}$$

If we then assume, with Becquerel and Hittorf, that $M - r$ and $M_1 - r_1$ represent the resistances of the gaseous column at the respective strengths of current i and i_1, we have the singular result that these resistances are inversely as the strengths of the current, though in reality they are independent of it.

ONE WAY TO PREVENT DECAY OF WOOD POSTS.

The decay of wood embedded in the earth is difficult to guard against, but, according to the British Farmers' Gazette, a simple precaution, costing neither money nor labor, will increase the durability of posts put in the ground by 50 per cent. This is simply by taking care that the wood is inverted, i. e., placed in the opposite direction to that in which it grew. Experiments have proved that oak posts put in the ground in the same position in which they grew, top upward, were rotten in twelve years, while their neighbors, cut from the same tree and placed top downwards in the soil, showed no signs of decay for several years afterward. The theory is that the capillary tubes in the tree are so adjusted as to oppose the rising moisture when the wood is inverted.

A new use for the micro-telephone has been devised by Count Hugo Von Eugenberg, at Castle Tratzberg, in the Tyrol, namely, for finding under ground watercourses. At several different places on the declivity of a hill, he buries a number of microphones in the soil, and connects each of them with a battery and a separate telephone. In the night, when other sources of disturbances are wanting, or less noticeable, he listens at the telephones, and is enabled to detect in this manner the faintest murmur or gurgling of water within the earth to a considerable depth. The microphone plays the part of the sensitive ear of hunter or savage, who is often able to detect the presence in the same way.

MAGNETIC BRICKS.

It was lately observed by Herr Kepner, at Salzburg, in the Tyrol, that some old bricks had an attractive or repellent force on a compass. From each of eight varieties of clay in the neighborhood two bricks were moulded, and one of the two in each case was baked. The unbaked bricks had no action on a magnetic needle, but seven of the eight baked bricks proved polarly magnetic. Some further experiments have been made by Herren Kell and Trientl. Particles of powder of the magnetic bricks adhered to a steel magnet. Breunerite, mica-slate, argillaceous irongarnet, chlorite, and hornblende were, before heating, unmagnetic, but intense heating produced a magnetic polarity, the axis of which seemed to be perpendicular to the plane of stratification.

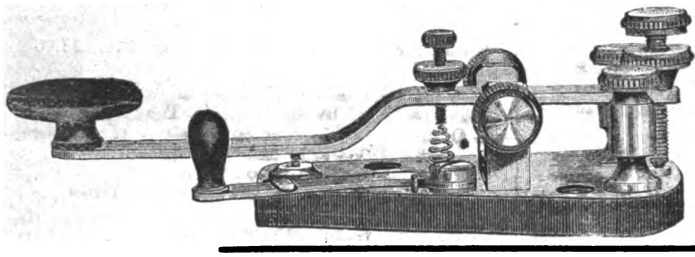
THE SECRESY OF TELEGRAMS.

In reply to Mr. Paleston, who asked the Postmaster-General whether he had now considered the question of destroying telegrams and the insurance by that means of the same freedom and secresy for telegrams as for communications by letter, Mr. Fawcett stated in the House of Commons last Thursday week that the practice of the Post Office had hitherto been to refuse to produce telegrams in court except upon a request by the sender or receiver, or upon the order of the judge. Some doubt having been expressed as to the legality of the course followed by the Department, he proposed to insert a clause in a Post Office Bill about to be introduced which would bring telegrams under similar provisions as to secresy as were now applicable to letters.

An arrangement of the bichromate of potash battery has been introduced by Mr. F. Higgins, of London. The cell consists of an earthenware jar fitted with an overflow spout near the mouth, and on the bottom is placed scrap zinc in a pool of mercury. A copper wire insulated with gutta-percha, except at the foot, where it enters the amalgam of zinc and mercury, passes down the middle of the jar. Two carbon plates arranged parallel to each other are suspended from the mouth of the cell by a frame and connected by an electrode. The battery of these cells is built up by placing each one a little below the one before it on a step, platform, or stair, so that the overflow liquor of one cell may run into the next, and thus a continual circulation of waste liquor may be going on from the high reservoir to the low one. The circulation prevents polarization of the plates and produces a powerful and steady current. The electromotive force of each cell is from 1.9 to 2 volts, and its internal resistance is a mere fraction of an ohm.

PARTRICK & CARTER'S SPECIALTIES.

PERFECTION AT LAST!



The "Acme Steel Lever Key"

For beauty of design, lightness, easy working, durability, and for fast-sending surpasses all other Keys ever made,

Price, by mail to any part of the United States or Canadas, **$3 00.**

This Key has a hard rubber base, with top connections, and is entirely nickel plated, and has received the endorsement of hundreds of operators as being the **perfection of all Keys.**

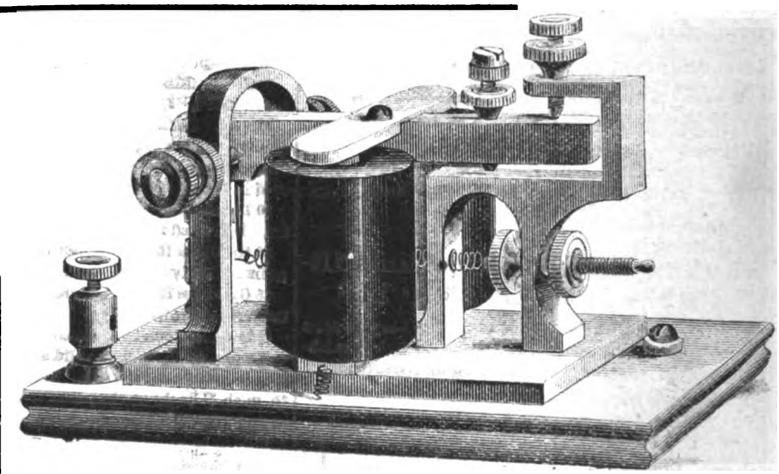
We have always been foremost in the production of "TELEGRAPHIC SPECIALTIES" and challenge the world in our line of manufactures to surpass our goods for cheapness, durability, finish and general workmanship.

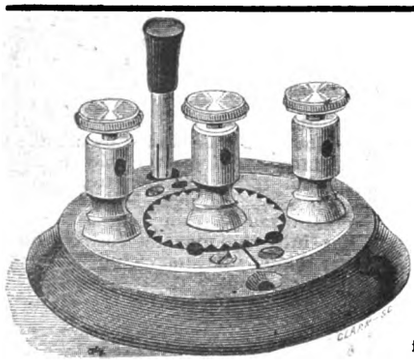
We offer in addition to this splendid Key, our other specialties, as follows:

The New Giant Sounder Perfected.

Price, $5.00, by mail.

Patented February 16, 1875, and the only patent ever granted embodying the principles contained in the "GIANT SOUNDER," and which is absolutely owned and controlled by us.





The Champion Lightning Arrester and Cut-Out.

Price, $1.25, by mail.

This Lightning Arrester, Cut-Out and Ground-Switch combined, of which we are the originators, has been extensively copied and imitated *but never equalled.*

Premium Learners' Apparatus

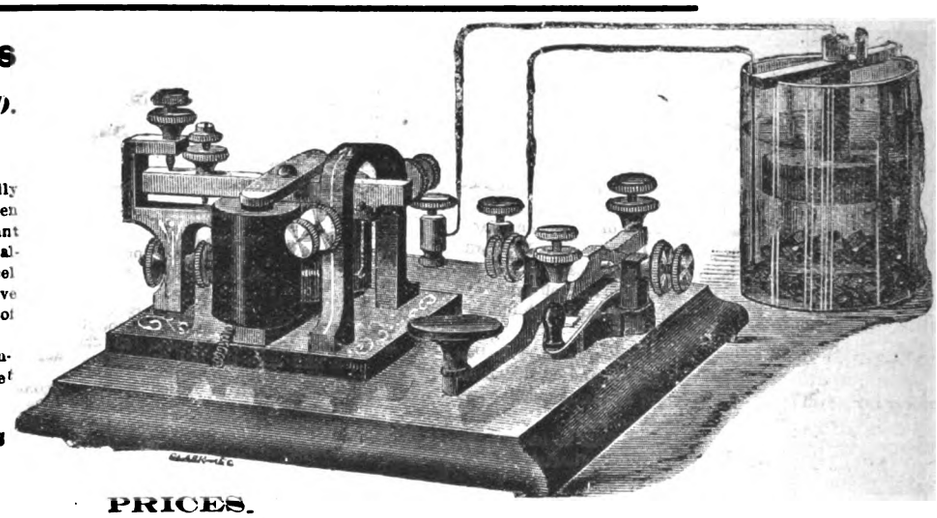
$5.00 Or Short Line Instrument. $5.00.

Not the Cheapest, but Guaranteed the Best!

THE PREMIUM LEARNERS' APPARATUS is manufactured especially to meet the demand for learners and for short lines of from one to ten miles in length. The outfit for a learner comprises the New Giant Sounder (Perfected), and the New Curved Key, placed upon a fine walnut base, one cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction. Hundreds of young men and ladies have learned the art of Telegraphing with these Instruments and Book of Instruction without any other teacher.

Our Book of Instruction, which accompanies this instrument, contains the alphabet, with Examples and Lessons especially adapted to meet the wants of the beginner.

We Guarantee our Instruments as Represented.



PRICES.

Complete Outfit, Money in advance	$5.00	Extra Coppers for Battery, each, Money in advance	.15
Instrument, without Battery, Money in advance	4.20	" Hangers " " " "	.10
" " " " " wound with finer wires for lines of 1 to 15 miles	5.00	" Jars " " " "	.35
Premium Sounder, Separate Base, Money in advance	2.50	Small Office Wire, per foot, " " "	½ cent.
Premium Key, " " " "	1.75	Premium Learners' Instrument, Key and Sounder entirely Nickel-plated, without Battery	5.20
Cell of Battery, Complete, Money in advance	.80	Complete Nickel-plated Instrument, with Battery, etc.	6 00
Insulators, Porcelain, with Screws, Money in advance	.06	" " Sounder, Separate Base	3.25
No. 14 Gal. Iron Wire, per mile " "	10,00	" " Key " "	2 00
Extra Zincs for Battery, each, " "	.25	Instruction Book	.25

Battery Jars cannot be sent by mail.

Instruments without Battery, sent by mail, 55 cents extra. Remit by P. O. Money Order, Draft, Registered Letter or Express.

All of the above instruments we were the first to manufacture and put before the public, and we will guarantee the best goods for the least money, and know this is the verdict of the Telegraphic Profession.

Send for Catalogues and Circulars before purchasing elsewhere, and get the best manufactured.

PARTRICK & CARTER,

Manufacturers of the Best Telegraphic Instruments and Supplies,

114 South Second Street, Philadelphia, Pa.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 158—October 31, 1882.

CHARLES B. NOYES. HENRY C. MAYNARD.

CHARLES B. NOYES died in New York City, September 26, 1882, of Aneurism of the Aorta. His certificate, No. 3081, was issued August 17, 1877.

The above claim will be paid from surplus.

HENRY C. MAYNARD died at Geneva Lake, Wis., October 20, 1882, in a Congestive Chill. His certificate, No. 2957, was issued April 13, 1877.

One dollar is due to meet this assessment, from members holding Certificates up to and including No. 4293.

Insurance expires Nov. 30, 1882; Membership Dec. 30, 1882.

The number of members of the Association in good standing is: 1st Division, 2324; Second Division, 139.

Net increase in membership, First Division, since last assessment: 21.

ASSESSMENT 159.—December 1, 1882.

MORRIS E. MOSBY. WILLIAM W. CUMMINGS.

MORRIS E. MOSBY died at Jacksonville, Ala., October 5, 1882, of Congestion of the Brain. His certificate, No. 4012, was issued September 19, 1881.

The above claim will be paid from surplus.

WILLIAM W. CUMMINGS died at Toledo, Ohio, October 26, 1882, of Bright's Disease of the Kidneys. His certificate, No. 294, was issued February 26, 1869.

One dollar is due to meet this assessment, from member holding Certificates up to and including No. 4294.

This claim should be paid before December 31, 1882, as Insurance expires on that day. Membership expires January 30, 1883.

The number of members of the Association in good standing is: First Division, 2336; Second Division, 140.

Net increase in membership, First Division, since last Assessment: 12.

BY-LAWS—SECTION VIII. "Upon the death of a member of the Association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and in case payment shall not be made within 30 days thereafter, the delinquent shall forfeit all claim to the benefits of the Association; and should payment not be made within 60 days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these By-Laws."

A. R. BREWER,
Secretary,
P. O. BOX. 3175 NEW YORK.

JOURNAL OF THE TELEGRAPH

VOL. XV. NEW YORK, DECEMBER 20, 1882. WHOLE NO. 354.

QUARTERLY REPORT OF THE WESTERN UNION TELEGRAPH COMPANY, FOR THE QUARTER ENDING DECEMBER 31, 1882.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, *December* 13, 1882.

The following statement will show the condition of the Company at the close of the quarter ended September 30, 1882:

Surplus, July 1, 1882, as per last quarterly report		$1,664,240 13
Net revenues, quarter ended September 30, 1882		2,289,489 01
		$3,953,729 14
From which deducting appropriations for—		
Dividend of 1¼ per cent., paid October 16	$1,199,781 81	
Interest on Bonded Debt	106,850 00	
Sinking Funds	20,000 00	
	$1,326,631 81	
Less portion of the Sinking Fund for the bonds of 1900 (which was set aside previously) returned to the Company by the Union Trust Co., trustees, because of the drawn bonds not having been presented for redemption	40,000 00	
		$1,286,631 81
Leaves a surplus, October 1, 1882, of		$2,637 097 33
The net revenues for the quarter ending December 31, instant, based upon nearly completed returns for October, partial returns for November, and estimating the business for December, will be about		$2,150,000 00
Add surplus, October 1, as above		2,667,097 33
		$4,817,097 33
From which appropriating for—		
Interest on Bonded Debt	$106,850 00	
Sinking Funds	20,000 00	
		$126,850 00
Leaves a balance of		$4,690,247 33
It requires for the payment of a dividend of 1¼ per cent. on the Capital Stock		$1,199,800 00
Deducting which, leaves a surplus, after paying dividend, of		$3,490,447 33

Respectfully submitted,
NORVIN GREEN,
President.

On motion, the following resolutions were adopted, to wit:

In view of the statements submitted—

Resolved, That a dividend of one and one-half per cent. from the net earnings of the three months ending December 31, be, and is hereby declared payable on the 15th day of January next, to stockholders of record, at the close of business on the 20th day of December, instant.

Resolved, That, for the purpose of such dividend, the stock books of the Company be closed at three o'clock on the afternoon of the 20th day of December, instant, and be re-opened on the morning of the 16th of January next.

CONSTANT BICHROMATE BATTERIES.

To the Editor of the Journal of the Telegraph:

THE matter of rendering galvanic batteries in which "bichromate solution" is used constant in action, without introducing a porous cell which so largely increases the internal resistance, has received considerable attention and many devices have been proposed and tried to effect such purpose, among which have been keeping the liquid boiling, changing solutions with syphons or by overflow, motion of plates, automatic stivers, &c. The following method I have used about five years, it may be interesting and possibly of utility to experimenters, and as the same method is applicable to other forms of battery besides bichromate cells. I have named such *Vortex Batteries* as a convenient designation (indicating a method.)

Take a battery jar of any designated size. Cast the zinc in form of a hollow cone, of varying thickness, cast with a ledge or collar, which rests all around on the edge of the jar forming a heavy and tight cover. The thickness depends on the size of battery made, a usual thickness is 1·20th of an inch at the collar and one half an inch at the point of the cone, depending of course upon the size of the battery being constructed.

The zinc is thoroughly amalgamated and the inside hollow of the cone is well coated with gas fitters cement, (wax, resin and venetian red), which resists acid very well; bore a small hole through the apex of the cone and insert a small glass tube through the apex of the cone projecting a quarter of an inch below the point, but flush with the cemented surface inside the hollow.

The carbon is a plate at the bottom of the jar laid flat and well secured to a sheet of lead on its under side by tongues in the lead and then well cemented to prevent injurious contact on its under surface and a lead strip also cemented, leading out and up to the proper screw cup above the zinc collar insulated from zinc by ordinary means, a proper slit being cut in the collar for that purpose. The other screw cup is attached to the opposite side of the jar into the collar on that side.

To set up the battery: Put the carbon in place at the bottom, charge the jar with sulphuric acid and water—usual proportions. Set in the zinc cone so the slit in the collar receives the cemented lead strip of the carbon, and its screw cup falls in its proper place just over the collar. The liquid rises through the tube into the cemented hollow of the cone at the top.

Put a quantity of brichromate salt in a small cloth bag and lay it in the liquid in the hollow of the cone. A stream of red liquid now appears falling from the glass tube down the center of the jar through the rest of the liquid to the carbon plate at the bottom, its gravity being greater than the clear liquid, the battery goes to work at once and furnishes a powerful and steady current for hours. Its internal resistance is very low The reason of its steady action can be seen, as the falling red liquor creates in the rest of the liquid a *vortex* current which continuously forces the acid up against the zinc, and so long as any working acid is in the liquid or salt in the top, the current flows with great uniformity.

The object of the short piece of glass tube is to prevent the hole in the point of the cone becoming enlarged, which it was found to do without it.

A cover is added to prevent evaporation—to stop it at any time without disconnecting or disturbing, simply take out the bag of crystals of bichromate and put it in a convenient tumbler alongside. The action soon stops from polarization as usual, a plug to stop the flow inserted at the upper end of the tube answers a like purpose.

J. MILTON STEARNS, JR.

THE EFFICIENCY OF INCANDESCENT ELECTRIC LAMPS.

A committee, consisting of Prof. George F. Barker, of Philadelphia; William Crookes, of London; and others, made a series of experiments on the incandescent electric lamps exhibited at Paris last year. The following are the conclusions reached after elaborate tests, as given in the report of the committee:

1st. The maximum efficiency of incandescent lamps in the present state of the subject, and within the experimental limits of this investigation, can not be assumed to exceed 300 candle-lights per horse-power of current.

2d. The economy of all lamps of this kind is greater at high than at low incandescence.

3d. The economy of light-production is greater in high resistance lamps than in those of low resistance, thus agreeing with the economy of distribution.

4th. The relative efficiency of the four lamps examined, expressed in Carcel burners of 7.4 spermaceti candles each, produced by one horse-power of current, is as follows: (A) At 16 candles: Edison, 26.5; Swan, 24; Lane-Fox, 23.5; and Maxim, 20.4. (B.) At 32 candles: Edison, 41.5; Lane-Fox, 37-4; Swan, 35.5; and Maxim, 32.4. To double the light given by these lamps, the current-energy was increased, for the Maxim and Lane-Fox lamps, 26 per cent.; for the Edison lamp, 28 per cent.; and for the Swan lamp, 37 per cent.